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FEASIBILITY STUDY AT SITE 12, TETRAETHYL LEAD DISPOSAL AREA NAS WHITING FIELD FL
7/1/1999
HARDING LAWSON ASSOCIATES

# FEASIBILITY STUDY
# SITE 12, TETRAETHYL LEAD DISPOSAL AREA

## NAVAL AIR STATION WHITING FIELD
## MILTON, FLORIDA

## UNIT IDENTIFICATION CODE: N60508
## CONTRACT NO.: N62467-89-D-0317/116

## JULY 1999

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA 29418

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**Prepared by:**

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**Naval Facilities Engineering Command**
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**Linda Martin, Code 1859, Engineer-in-Charge**

**July 1999**


CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/116 are complete and accurate and comply with all requirements of this contract.

DATE: July 6, 1999

NAME AND TITLE OF CERTIFYING OFFICIAL: Rao Angara
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Eric Blomberg, P.G.
Project Technical Lead

(DFAR 252.227-7036)


The evaluations and professional opinions rendered in this planning document describing the Feasibility Study for Site 12, Naval Air Station Whiting Field, Milton, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document is not intended to be used for construction of the selected alternative.

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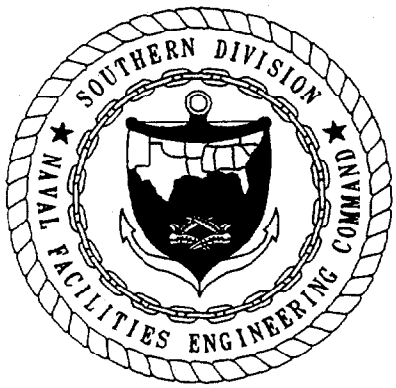
Date: 7-7-99




# FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, and/or disposal of hazardous materials. Through accidental spills or leaks or as a result of conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by current standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act, and the Hazardous and Solid Waste Amendments of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. The CERCLA and SARA acts form the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adopted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follow:

- preliminary assessment (PA),
- site inspection (SI) (formerly the PA and SI steps were called the Initial Assessment Study under the NACIP program),
- remedial investigation and feasibility study, and
- remedial design and remedial action.

The Southern Division, Naval Facilities Engineering Command manages and the U.S. Environmental Protection Agency and the Florida Department of Environmental Protection (formerly Florida Department of Environmental Regulation) oversee the Navy environmental program at Naval Air Station (NAS) Whiting Field, Milton, Florida. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the CERCLA program at NAS Whiting Field should be addressed to Ms. Linda Martin, Code 1859, at (845) 820-5574.

## EXECUTIVE SUMMARY

Harding Lawson Associates (HLA) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command to complete a feasibility study (FS) for Site 12, Tetraethyl Lead Disposal Area, at Naval Air Station (NAS) Whiting Field, Milton, Florida. The FS report is being completed under contract number N62467-89-D-0317-116. The FS report for Site 12 is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (HLA, 1998) and Remedial Investigation (RI) report (ABB Environmental Services, Inc., 1998) to present the results of the overall RI/FS for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives that address contaminated media at Site 12.

Site 12 is located in the southeastern part of the facility adjoining Site 11 and is less than 0.1 acre in size. The disposal area consists of six earth-covered sludge mounds within a fenced area of approximately 100 feet by 25 feet. The mounds range from approximately 3 to 5 feet in height and 5 to 10 feet in diameter. Each sludge pile reportedly contained approximately 200 to 400 gallons of sludge. The piles are composed of tank bottom sludge generated from cleaning the north and south aqua system fuel storage tanks and fuel filters. The piles are reported to be contaminated with tetraethyl lead, a component of aviation gasoline. Disposal of the sludge reportedly occurred in May 1968.

Based on the results of the RI, which included a risk assessment, the primary chemical of concern (COC) at Site 12 is arsenic in surface soil. The risk assessment indicated an excess lifetime cancer risk of $9 \times 10^{-6}$ for an aggregate resident exposed to arsenic in surface soil at the site. However, the concentration of arsenic at the site is less than the site-specific soil cleanup goal established for arsenic at NAS Whiting Field disposal sites (refer to Appendices A and B). The use of the site-specific cleanup goal for arsenic at these disposal sites requires that land-use controls (LUCs) be implemented. Although groundwater at NAS Whiting Field has been identified as a separate site (Site 40) and will be investigated and remediated separately from Site 12, no COCs or unacceptable risks were identified for this medium.

The purpose of the FS is to identify remedial action objectives (RAOs), and identify and evaluate remedial action alternatives that will achieve those objectives. The FS contains the identification and discussion of applicable or relevant and appropriate requirements (ARARs), and a brief overview of the findings of the RI and the risk assessment in order to identify RAOs. For Site 12, one RAO was established:

**RAO 1:** Reduce human health risk associated with exposure to surface soil with arsenic concentrations greater than action levels.

Remedial technologies that address site-specific considerations established in the RAO were identified and screened; those technologies that pass the screening phase were then developed into remedial alternatives.

After screening of remedial technologies, alternatives were developed and analyzed in detail for comparison in the comparative analysis. Three remedial alternatives were identified to address the RAO. These alternatives included

- the no action alternative (Alternative 1), which would include 5-year site reviews as required by the Comprehensive Environmental Response, Compensation, and Liability Act (estimated cost $19,000);

- an LUC alternative (Alternative 2), which would include 5-year site reviews and LUCs, including a continuing inspection program to ensure compliance while the restrictions are in effect (estimated cost $135,000);

- an off-site soil disposal/LUC alternative (Alternative 3), which would include the removal and off-site disposal of the soil mounds, 5-year site reviews and LUCs, including a continuing inspection program to ensure compliance while the restrictions are in effect (estimated cost $207,000).

In the comparative analysis, each alternative was compared against the others based on three criteria: threshold, primary balancing, and modifying. This analysis indicates the following:

- Alternative 1 should be eliminated from further consideration because it would not achieve the established RAOs.

- The implementation of Alternative 2 would provide a measure of continued protection of human health and the environment because the alternative includes LUCs. In this manner, Alternative 2 would achieve the RAO established for the site, and would, therefore, achieve ARARs.

- Alternative 3 would also achieve the RAO and ARARs, and would remove the soil mounds from the site.

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## GLOSSARY

| | |
|---|---|
| ABB-ES | ABB Environmental Services, Inc. |
| ARAR | applicable or relevant and appropriate requirement |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| ECPC | ecological chemicals of potential concern |
| ELCR | excess lifetime cancer risk |
| ERA | ecological risk assessment |
| FDEP | Florida Department of Environmental Protection |
| FS | feasibility study |
| GIR | General Information Report |
| GCTL | groundwater cleanup target level |
| HHRA | human health risk assessment |
| HHCPC | human health chemical of potential concern |
| HLA | Harding Lawson Associates |
| IR | Installation Restoration |
| LUC | land-use control |
| LUCAP | Land-Use Control Assurance Plan |
| LUCIP | Land-Use Control Installation Plan |
| MCL | maximum contaminant level |
| NAS | Naval Air Station |
| NCP | National Oil and Hazardous Substances Contingency Plan |
| RA | risk assessment |
| RAO | remedial action objective |
| RBC | risk-based concentration |
| RI | remedial investigation |
| RME | reasonable maximum exposure |
| ROD | record of decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SCTL | soil cleanup target level |
| SOUTHNAV-FACENGCOM | Southern Division, Naval Facilities Engineering Command |
| SVOC | semivolatile organic compound |
| TBC | to be considered |
| TRPH | total recoverable petroleum hydrocarbons |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| $yd^3$ | cubic yard |

# 1.0 INTRODUCTION

Harding Lawson Associates (HLA) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) to complete a feasibility study (FS) for Site 12, Tetraethyl Lead Disposal Area, at Naval Air Station (NAS) Whiting Field, Milton, Florida. The FS is being completed under contract number N62467-89-D-0317-116. The FS report for Site 12 is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) (HLA, 1998) and Remedial Investigation (RI) report (ABB Environmental Services, Inc. [ABB-ES], 1998) to present the results of the overall RI/FS for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives that address contaminated media at Site 12.

Investigations at NAS Whiting Field, a facility listed on the National Priority List, are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR], Part 300). The investigations at the facility are being conducted under the Navy's Installation Restoration (IR) program, which is designed to identify and abate or control contaminant migration resulting from past operations at naval installations while working within the aforementioned regulatory framework. SOUTHNAVFACENGCOM is the agency responsible for the Navy's IR program in the southeastern United States. Therefore, SOUTHNAVFACENGCOM has the responsibility to process NAS Whiting Field through preliminary assessment, site inspection, RI/FS, and remedial response selection.

The goals of the RI/FS for Site 12 at NAS Whiting Field are (1) to assess the extent, magnitude, and impact of contamination at the site; (2) to qualitatively and quantitatively assess the risk posed to human health and the environment by site-related contamination; and (3) to develop remedial alternatives that address threats to human health and/or the environment. The first two elements have been discussed in the GIR and RI reports; the remaining element will be presented and discussed in this FS Report.

The GIR provides information common to all sites at NAS Whiting Field, such as

- facility information and history,
- description of physical characteristics of the facility (climatology, hydrology, soil, geology, and hydrogeology),
- summary of previous investigations,
- summary of the field investigations activities conducted during the RI,
- risk assessment (RA) methodology for both human health and ecological receptors, and
- a summary of the facilitywide background evaluation.

The RI serves as the mechanism for collecting data to identify the source of contamination and migration pathway characteristics for conducting a baseline RA, and for collecting physical measurements and chemical analytical data necessary for remedial alternative evaluation in the FS. The RI provides the basis for determining whether or not remedial action is necessary. The RI Report for Site 12 at NAS Whiting Field provides the following information:

- a site description and a summary of previous investigations for Site 12;
- a summary of the field investigation methods used during the RI at the site;
- a site-specific data quality assessment;
- an assessment of the extent, magnitude, and impact of contamination at the site; and
- a qualitative and quantitative assessment of risks to human health and the environment.

The FS, described in more detail later in this chapter, uses the results of the RI and the information presented in the GIR to identify remedial action objectives (RAOs) and to develop, screen, and evaluate potential remedial alternatives. The FS is prepared in accordance with the following regulations and guidance documents: CERCLA, as amended by SARA (references made to CERCLA in this report should be interpreted as "CERCLA, as amended by SARA"); the NCP; 40 CFR, Part 300; and *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (RI/FS Guidance) (U.S. Environmental Protection Agency [USEPA], 1988).

The remaining sections in this chapter describe the FS process for CERCLA sites (Section 1.1), present how this process is applied to NAS Whiting Field sites (Section 1.2), and provide the conceptual understanding of Site 12 environmental conditions as of the completion of the RI report (Section 1.3).

1.1 THE CERCLA FS PROCESS. The development of remedial alternatives for CERCLA sites consists of developing RAOs and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the RAOs. The NCP requires that a range of alternatives be presented in the FS to the maximum practicable extent.

The first step in the FS process is to develop RAOs that specify the contaminants, media of interest, exposure pathways, and preliminary remedial goals that permit a range of alternatives to be developed. The preliminary remedial goals are developed based on chemical-specific applicable or relevant and appropriate requirements (ARARs) (when available), site-specific risk-based factors, or other available information.

Once RAOs are identified, general response actions for each medium of interest are developed. General response actions typically fall into the following categories: no action, containment, excavation, extraction, treatment, disposal,

or other actions, singularly or in combination, taken to satisfy the RAOs for the site.

The next step in the FS process is to identify and screen applicable technologies for each general response action. This step eliminates those technologies that cannot be implemented technically. Those technologies that pass the screening phase are then assembled into remedial alternatives. Remedial alternatives are then described and analyzed in detail using seven criteria described in the NCP, including

- overall protection of human health and the environment;
- reduction of toxicity, mobility, or volume of contaminants through treatment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- short-term effectiveness;
- implementability; and
- economics (i.e., cost).

Alternatives are evaluated against two additional factors after State participation and the public comment period for the FS. The factors are

- State acceptance, and
- community acceptance.

The results of the detailed analyses (for the first seven criteria) are summarized and compared in a comparative analysis. The alternatives are compared with each other against several criteria, including the following:

**Threshold criteria:**
- protection of human health and the environment; and
- attainment of Federal and State human health and environmental requirements identified for the site.

**Primary Balancing criteria:**
- cost effectiveness;
- use of permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable; and
- preference for treatment that reduces toxicity, mobility, or volume of contaminants as a principal element.

These criteria are used because SARA requires them to be considered during remedy selection. **Modifying criteria**, which include State and community acceptance, are also evaluated. State acceptance is evaluated when the State reviews and comments on the draft FS report and a Proposed Plan is then prepared in

consideration of the State's comments. Community acceptance is evaluated based on comments received on the Proposed Plan during a public comment period. This evaluation is described in a responsiveness summary in the Record of Decision (ROD).

The entire FS process provides the technical information and analyses that form the basis for a proposed remedial action plan (Proposed Plan) and the subsequent ROD that documents the identification and selection of the remedy.

1.2 PURPOSE OF THE FS REPORT FOR SITE 12. The purpose of the FS report for Site 12 at NAS Whiting Field is to document the results of the study that includes developing RAOs to address contaminated media at the site and developing, screening, and evaluating potential remedial alternatives to meet these objectives. The FS was based on the results and conclusions of the RI completed for the site, and the information presented in the GIR. Information presented in these reports will not be repeated in this FS report.

The purpose of the FS report for Site 12 is not to present all the possible variations and combinations of remedial actions that could be taken at the site, but to present distinctly different alternatives representing a range of options for meeting the RAOs. It is expected that these different alternatives can be adjusted during the proposed plan and decision process, and to a lesser extent during detailed design, to accomplish RAOs in a manner similar to the initially proposed alternative. The FS report also does not present information on alternatives that fail to meet the RAOs, except for a no action alternative, which provides a baseline for comparison of all alternatives.

The components listed below are considered in identifying appropriate remedial action for Site 12.

- RAOs (Chapter 2.0). RAOs are developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals for the site.

- Applicable Technologies (Chapter 3.0). Technologies applicable for addressing contaminated media at the site are identified and screened. Technologies that cannot be implemented are eliminated.

- Remedial Alternatives (Chapter 3.0). Technologies that pass the screening phase are assembled into remedial alternatives.

- Detailed Analysis (Chapter 4.0). Selected remedial alternatives are described and evaluated using seven of the nine criteria outlined in the NCP.

- Comparative Analysis (Chapter 5.0). Remedial alternatives identified for Site 12 are compared against each other using threshold and primary balancing criteria.

Upon completion of the FS report, a Proposed Plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Site 12. This document will be written in community-friendly language and will be made available for public comment. Upon receipt of public comments, responses to

these comments will be developed in a responsiveness summary, and the ROD will be prepared. The ROD will document the chosen alternative for the site, and will include the responsiveness summary as an appendix. Once the ROD is signed, the chosen remedial alternative will be implemented.

1.3 SITE 12 ENVIRONMENTAL CONDITIONS. Site 12, Tetraethyl Lead Disposal Area, is less than 0.1 acre in size and is located along the southeastern part of the facility adjoining Site 11 at NAS Whiting Field (Figure 1-1). The disposal area consists of six earth-covered sludge mounds within a fenced area of approximately 100 feet by 25 feet. The mounds range from approximately 3 to 5 feet in height and 5 to 10 feet in diameter. The site slopes toward the "Y" ditch (an unlined drainage ditch that runs along the southern site boundary (Figure 1-2).

According to the U.S. Department of Agriculture (USDA) (USDA, 1980), the soil at Site 12 is classified as Troup Loamy Sand. There is no evidence of a clay soil cap over the site area. Because the soil at the site is predominantly silty sand, much of the on-site rainfall infiltrates directly into the soil. Surface water runoff flows along the southern site boundary and is intercepted by drainage ditch "Y."

According to the Initial Assessment Study (Envirodyne Engineers, Inc., 1985), each sludge pile reportedly contained approximately 200 to 400 gallons of sludge. The piles are composed of tank bottom sludge generated from cleaning the north and south aqua system fuel storage tanks and fuel filters. Disposal of the sludge reportedly occurred in May 1968.

1.4 RI SUMMARY. The RI report was completed by ABB-ES in April 1998. The conclusions listed below from the RI are pertinent to the development of this FS.

- The subsurface soil encountered at Site 12 consisted of alternating layers of sand, silt, and clay. No continuous clay confining layers were identified during the RI.

- Four inorganic analytes (arsenic, calcium, iron, and lead) were detected in one or more surface soil samples at concentrations exceeding the background screening concentrations. Three inorganic analytes (aluminum, arsenic, iron, and vanadium) were detected at concentrations that exceed residential values for either the USEPA Region III risk-based concentrations (RBCs) or Florida soil cleanup target levels (SCTLs). However, only arsenic was detected at concentrations exceeding industrial standards for USEPA Region III RBCs (USEPA, (1998) or Florida SCTLs (FDEP, 1998b).

- Nine inorganic analytes (barium, calcium, cobalt, lead, magnesium, manganese, mercury, potassium, and sodium) were detected in subsurface soil samples at concentrations exceeding the background screening concentrations. However, none of the analytes detected exceeded the industrial standards for either the USEPA Region III RBCs (USEPA, (1998) or the Florida SCTLs (FDEP, 1998b).

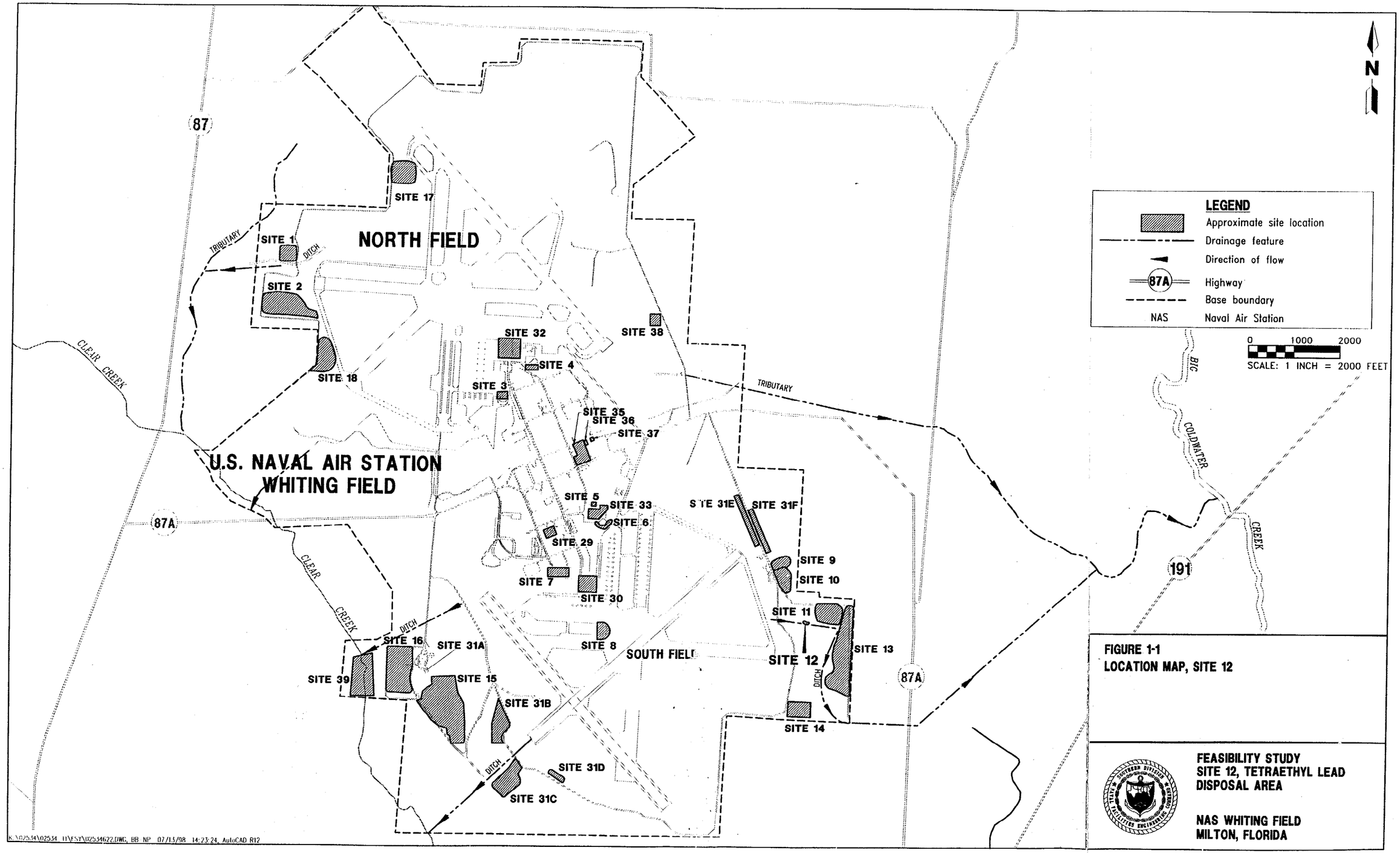


FIGURE 1-1
LOCATION MAP, SITE 12

FEASIBILITY STUDY
SITE 12, TETRAETHYL LEAD
DISPOSAL AREA

NAS WHITING FIELD
MILTON, FLORIDA

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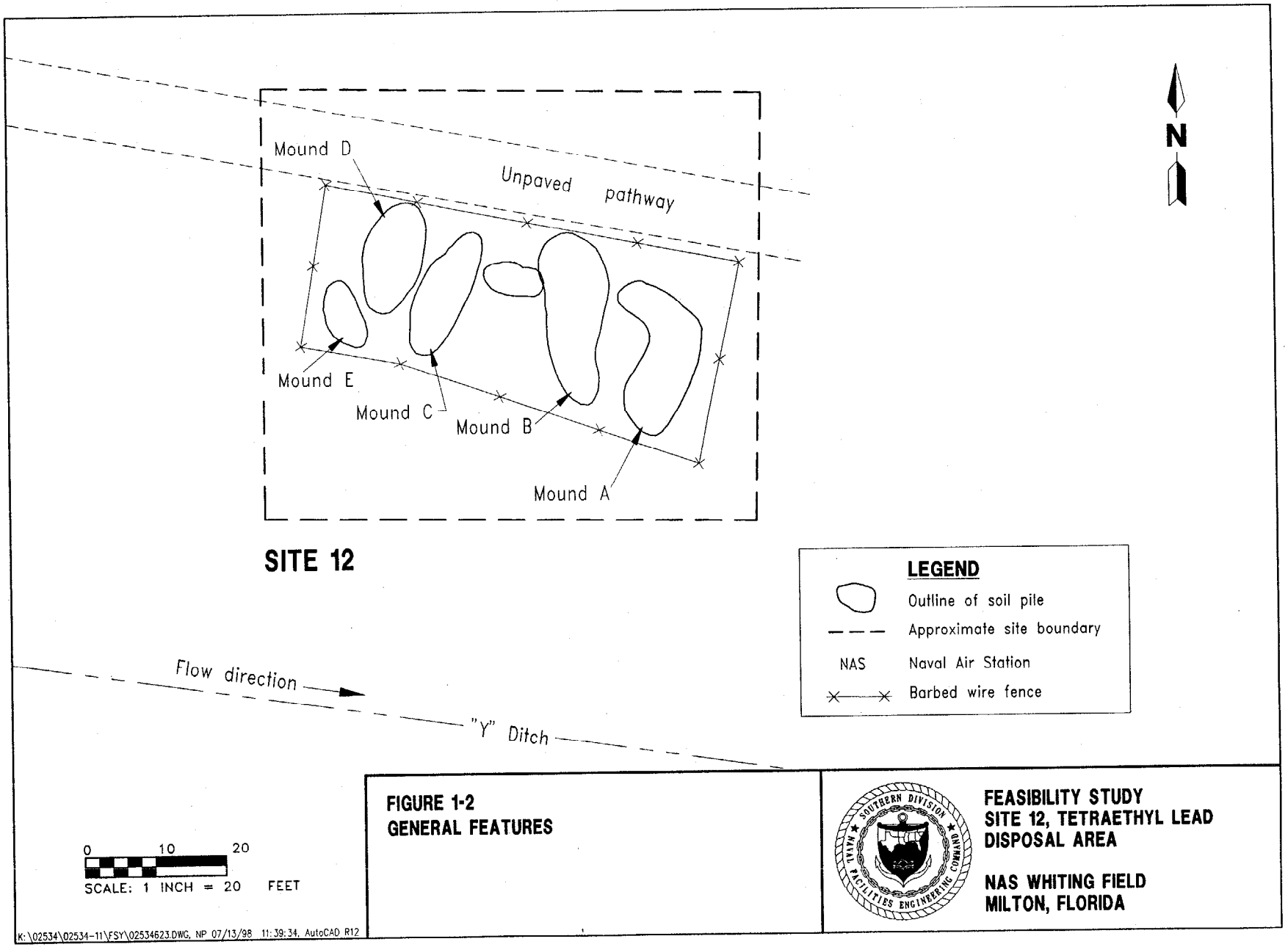


**FIGURE 1-2**
**GENERAL FEATURES**

**FEASIBILITY STUDY**
**SITE 12, TETRAETHYL LEAD DISPOSAL AREA**

**NAS WHITING FIELD**
**MILTON, FLORIDA**

- The human health risk assessment (HHRA) for Site 12 identified three inorganic analytes, arsenic, iron, and vanadium, as human health chemicals of potential concern (HHCPCs) for surface soil at the site. No analytes were selected as HHCPCs for subsurface soil. Thallium was the only HHCPC selected for groundwater at the site.

- The HHCPCs detected in surface soil, subsurface soil, and groundwater do not pose unacceptable carcinogenic risks to the evaluated receptors based on a comparison to the USEPA target risk range.

- The total excess lifetime cancer risk (ELCR) at Site 12, associated with ingestion of soil by a hypothetical future resident ($9 \times 10^{-6}$), exceeds Florida's target risk level of concern of $1 \times 10^{-6}$ due to arsenic.

- The background levels of arsenic at Site 12 exceed the Florida residential soil cleanup goal and may result in an unacceptable carcinogenic risk. It is likely that naturally occurring arsenic contributes to the Florida Department of Environmental Protection's (FDEP) target risk-level exceedence.

- The surface soil, subsurface soil, and groundwater noncancer risks are below USEPA and FDEP target levels for all potential current and hypothetical future receptors.

- The results of the ecological risk assessment (ERA) suggest that risks are not predicted for ecological receptor populations at Site 12. The site is overgrown, suggesting that native plant species are capable of surviving, growing, and reproducing at Site 12.

# 2.0 REMEDIAL ACTION OBJECTIVES

This section presents the goals and objectives for remedial action at Site 12 that provide the basis for selecting appropriate RAOs and, subsequently, identifying remedial technologies and developing alternatives to address contamination at the site. To establish these objectives, ARARs are first identified (Section 2.1). Next, RAOs are defined based on consideration of ARARs, the results and conclusions of the RI, the RA, and other criteria (Section 2.2). Finally, general response actions appropriate for technology identification are discussed (Section 2.3). The information presented in this chapter will be used to identify appropriate remedial technologies for the site (presented in Chapter 3.0).

2.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS. ARARs are Federal and State human health and environmental requirements used to define the appropriate extent of site cleanup, identify sensitive land areas or land uses, develop remedial alternatives, and direct site remediation. CERCLA and the NCP require that remedial actions comply with State ARARs that are more stringent than Federal ARARs, are legally enforceable, and are consistently enforced statewide.

The NCP defines two ARAR components: (1) applicable requirements, and (2) relevant and appropriate requirements.

> Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. State standards that may be applicable are only those which (1) have been identified by the State in a timely manner, (2) are consistently enforced, and (3) are more stringent than Federal requirements.
>
> Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements under Federal and State environmental and facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, or remedial action, address situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

"Applicability" is a legal determination of jurisdiction of existing statutes and regulations, whereas "relevant and appropriate" is a site-specific determination of the appropriateness of existing statutes and regulations. Therefore, relevant and appropriate requirements allow flexibility not provided by applicable requirements in the final determination of cleanup levels. Once a requirement is identified as an ARAR, the selected remedy must comply with ARARs, even if the ARAR is not required to assure protectiveness. The general relevant and appropriate requirements apply only to actions at the site. Applicable requirements apply to both on- and off-site remedial actions.

Under the description of ARARs set forth in the NCP and SARA, State and Federal ARARs are categorized as

- chemical-specific (i.e., governing the extent of site remediation with regard to specific contaminants and pollutants);
- location-specific (i.e., governing site features such as wetland, floodplains, and sensitive ecosystems and pertaining to existing natural and man-made site features such as historical or archaeological sites); and
- action-specific (i.e., pertaining to the proposed site remedies and governing the implementation of the selected site remedy).

Other requirements "to be considered" (TBC) are Federal and State nonpromulgated advisories or guidance that are not legally binding and do not have the status of potential ARARs (i.e., they have not been promulgated by statute or regulation). However, if there are no specific ARARs for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

During the detailed analysis of remedial alternatives, each alternative will be analyzed to determine its compliance with ARARs. Chemical-, location-, and action-specific ARARs are discussed in the following subsections and presented in Table 2-1.

2.1.1 Chemical-Specific ARARs Chemical-specific requirements are standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels or the basis for calculating such levels.

The State of Florida has promulgated cleanup target levels for contaminants found in soil for Brownfield sites. These target levels are listed in Chapter 62-785, Florida Administrative Code, and are based on dermal absorption of 0.0001, acute toxicity considerations, or leachability based on groundwater criteria. The USEPA has also provided a RBC table that specifies acceptable industrial and residential RBCs in soil (USEPA, 1998).

2.1.2 Location-Specific ARARs Location-specific ARARs govern site features (e.g., wetlands, floodplains, wilderness areas, and endangered species) and man-made features (e.g., places of historical or archaeological significance). These ARARs place restrictions on concentrations of hazardous substances or the conduct of activities based solely on the site's particular characteristics or location.

2.1.3 Action-Specific ARARs Action-specific ARARs are technology- or activity-based limitations controlling activities for remedial actions. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the detailed analysis of remedial alternatives. During the detailed analysis of alternatives, each alternative will be analyzed to determine compliance with action-specific ARARs.

## Table 2-1
## Synopsis of Federal and State ARARs and Guidance for Site 12

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| Name and Regulatory Citation | Description | Consideration in the Remedial Action Process | Type |
|---|---|---|---|
| Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Hazardous Substance and Contingency Plan Regulations (40 Code of Federal Regulations [CFR], Section 300.430) | Discusses the types of institutional controls to be established at CERCLA sites. | **Applicable.** These regulations may be used as guidance in establishing appropriate institutional controls at Site 12. | Action-specific |
| Occupational Safety and Health Act (29 CFR Part 1910) | Requires establishment of programs to ensure worker health and safety at hazardous waste sites. | **Applicable.** These requirements apply to response activities conducted in accordance with the National Contingency Plan. During the implementation of any remedial alternative for Site 12, these regulations must be attained. | Action-specific |
| Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Waste [40 CFR Part 261] | Defines those solid wastes that are subject to regulation as hazardous waste. | **Relevant and Appropriate.** Any excavated materials would be sampled and analyzed for hazardous characteristics as defined by 40 CFR Part 261. | Action-Specific |
| Hazardous Materials Transportation Act Regulations, [49 CFR Parts 171-179] | Provides requirements for packaging, labeling, manifesting, and transporting of hazardous materials. Similar requirements are found in 40 CFR Part 263. | **Relevant and Appropriate.** If surface soil, wetland sediments, or shoreline sediments are determined to be hazardous material and off-site disposal arranged, the hazardous material would need to be handled, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations. | Action-specific |
| RCRA Regulations, Standards Applicable to Transporters of Hazardous Wastes [40 CFR Part 263] | Establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation and management of that waste. To avoid duplicative regulation, USEPA has expressly adopted certain DOT regulations (see next entry) governing the transportation of hazardous materials. | **Relevant and Appropriate.** If surface soil is determined to be hazardous material and off-site disposal is arranged, the hazardous material would need to be handled, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations. | Action-specific |

See notes at end of table.

## Table 2-1 (Continued)
## Synopsis of Federal and State ARARs and Guidance for Site 12

Feasibility Study
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| Name and Regulatory Citation | Description | Consideration in the Remedial Action Process | Type |
|---|---|---|---|
| RCRA Regulations, Landfills (40 CFR, Part 264, Subpart N) | Provides monitoring, inspection, closure, and post-closure care requirements for landfills than contain hazardous waste. | **TBC.** These regulations are not applicable to Site 12 because they apply only to landfills that received waste after 1980; however, the requirements may be used as guidance for developing a landfill inspection program. | Guidance |
| Solid Waste Disposal Act Regulations, Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258) | This rule establishes minimum standards for design and operation of municipal solid waste landfills. | **Relevant and Appropriate.** Although this regulation applies to RCRA municipal landfills, not CERCLA landfills, some applications may apply. | Guidance |
| Florida Petroleum Contaminated Site Cleanup Criteria (Chapter 62-770, Florida Administrative Code [FAC]) | Rule establishes a cleanup process to be followed at petroleum-contaminated sites. The cleanup criteria apply to sites contaminated with petroleum or petroleum products but does not apply to sites contaminated with significant quantities of other substances. | **Relevant and Appropriate.** Site 12 sludge was generated from the cleaning fuel storage tanks and fuel filters. This cleanup criteria may be used as guidance. | Chemical-specific |
| Region III Risk-Based Concentrations (USEPA, 1998) | Provides RBCs from ingestion or exposure to chemicals in soil, tap water, ambient air, and fish consumption. | **Relevant and Appropriate.** The chemicals detected at Site 12 were screened against these standards for selection of chemicals of concern and developing remedial action alternatives. | Chemical-specific |
| Florida Brownfields Cleanup Criteria Rule (Chapter 62-785, FAC) | Provides guidance for soil cleanup levels that can be developed. | **TBC.** These guidelines aid in determining health and leachability-based cleanup goals for soil, if necessary. | Guidance |
| Florida Rules on Hazardous Waste Warning Signs (Chapter 62-736, FAC) | Requires warning signs at National Priorities List (NPL) sites to inform the public of the presence of potentially harmful conditions. | **Applicable.** This requirement is applicable for sites that are on the NPL. | Action-specific |
| Florida Solid Waste Disposal Facility Regulations (Chapter 62-701, FAC) | Provides the minimum landfill final closure standards for inactive landfills. Chapter 62-701.600 provides information on closure procedures, permits, closure report, design plan, final cover design, and post closure monitoring. | **Relevant and Appropriate.** Although these regulations are not directly applicable because Site 12 did not receive wastes after the effective date of regulation (1985); Chapter 62-701.600, FAC, provides guidance for closure procedures. | Action-specific; Guidance |
| Florida Hazardous Waste Rules (Chapter 62-730, FAC) | Adopts specific sections of the federal hazardous waste regulations, including the section regulating hazardous waste landfills (40 CFR, Part 264, Subpart N) and makes additions to these regulations. | **Relevant and Appropriate.** These regulations are not applicable to Site 12 because they apply only to landfills that received waste after 1983; however, the requirements may be used as guidance for developing a landfill inspection program. | Chemical-specific; Action-specific |

See notes at end of table.

## Table 2-1 (Continued)
## Synopsis of Federal and State ARARs and Guidance for Site 12

Feasibility Study
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Naval Air Station Whiting Field
Milton, Florida

| Name and Regulatory Citation | Description | Consideration in the Remedial Action Process | Type |
|---|---|---|---|
| RCRA Regulations, Releases from Solid Waste Management Units (40 CFR, Part 264, Subpart F) | Contains general groundwater monitoring requirements. Establishes detection and compliance monitoring programs that apply to owners and operators of solid waste units. | **TBC.** For capping alternatives, these regulations provide guidance for establishing and conducting a groundwater monitoring program at sites contaminated with RCRA wastes. | Guidance |
| Safe Drinking Water Act (SDWA) (40 CFR, Parts 141 and 143) | Establishes maximum concentration levels for contaminants in groundwater. Levels are determined based on protection of human health, technologies available for treatment, and cost data. | **Applicable.** For containment alternatives where contaminants are left on site, these values should be considered when evaluating data from the groundwater monitoring program. | Guidance |
| Florida Surface Water Standards (Chapter 62-302, FAC) | This rule classifies Florida surface waters into five classes based on designated uses and establishes ambient water quality criteria for listed pollutants. | **Relevant and Appropriate.** During periods of heavy rainfall, "Y" ditch may convey stormwater runoff from the site. Although the surface water does not pose a risk to human health or ecological receptors, the rule would be used of surface water monitoring was required. | Guidance |
| Florida Groundwater Classes, Standards and Exemptions (Chapter 62-520, FAC) | Designates groundwater of the State into 5 classes and establishes minimum "free from" criteria. The regulation also specifies that Classes I & II must meet the primary and secondary drinking water standards listed in Chapter 62-550, FAC. | **Applicable.** The regulations may be used to evaluate data from a groundwater monitoring program, if necessary. | Chemical-specific |
| Florida Drinking Water Standards (Chapter 62-550, FAC) | Provides maximum concentration levels for contaminants in groundwater in the State of Florida. Implements the Federal SDWA by adopting the primary and secondary drinking water standards and by creating additional rules to fulfill State requirements. | **Applicable.** The values in this guidance should be considered when evaluating data from the groundwater monitoring program, if necessary. | Chemical-specific |
| Florida Groundwater Guidance Concentrations (June 1994) | Provides maximum concentration levels for contaminants in groundwater in the State of Florida. Groundwater with concentrations less than the listed values are considered "free from" contamination. | **TBC.** The values in this guidance should be considered when evaluating data from the groundwater monitoring program, if necessary. | Guidance |

Notes: ARAR = applicable or relevant and appropriate requirement.
USEPA = U.S. Environmental Protection Agency.
DOT = Department of Transportation.
TBC = "to be considered" guidance materials.

Certain action-specific ARARs include permit requirements. Under CERCLA Section 121(e), permits are not required for remedial actions conducted entirely on site at Superfund sites. This permit exemption applies to all administrative requirements, including approval of or consultation with administrative bodies, documentation, record keeping, and enforcement. However, the substantive requirements of these ARARs must be attained.

2.1.4 TBC Criteria As previously stated, TBCs are Federal and State nonpromulgated advisories or guidance that are not legally binding and do not have the status of being a potential ARAR (i.e., have not been promulgated by statute or regulation). However, if there are no specific regulatory requirements for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

2.2 IDENTIFICATION OF RAOs. RAOs are defined in the CERCLA RI/FS guidance manual as media-specific goals that are established to protect human health and the environment, and are typically based on chemicals of concern, exposure routes, and receptors present or available at the site. RAOs are developed to ensure compliance with ARARs. RAOs for Site 12 will be identified by consideration of ARARs, the RI, and the RA.

Groundwater. Although groundwater at NAS Whiting Field has been identified as a separate site (Site 40), which will be investigated and remediated separately from Site 12, chemical-specific ARARs and TBCs for groundwater were considered when identifying RAOs for Site 12 based on ARARs. The concentration of one chemical (aluminum) detected in one groundwater sample was greater than the Federal maximum contaminant level (MCL), Florida drinking water standard, and/or Florida groundwater cleanup target level (GCTL). This chemical, aluminum, is an inorganic, and is regulated under the Federal and State secondary drinking water standards. Table 2-2 lists this chemical, its respective concentration, Federal MCL, Florida drinking water standard, and Florida GCTL. Although the concentration of this chemical exceeded the secondary regulatory standards, it was below the background screening concentration. The RA conducted for groundwater at this site did not identify unacceptable risks (i.e., the risks predicted were less than the USEPA target risk range and the FDEP risk thresholds). Therefore, based on these considerations, an RAO will not be established for groundwater for Site 12.

The ecological assessment completed for Site 12 did not include exposure to groundwater by ecological receptors. This is because there are no current or future predicted exposure pathways for ecological receptors to groundwater. Therefore, no RAOs will be established for groundwater based on ecological receptor exposure.

Surface Soil. Chemical-specific ARARs and TBCs for surface soil were considered when identifying RAOs based on ARARs. The concentration of one chemical, arsenic, detected in surface soil exceeded its respective residential and industrial Florida SCTLs and USEPA Region III RBCs. Table 2-3 provides a summary of the detected concentrations of arsenic and its respective cleanup target levels.

The HHRA completed for Site 12 evaluated risks to current and future users of the site due to HHCPCs arsenic, iron, and vanadium. The risks posed to trespassers,

## Table 2-2
## Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Groundwater at Site 12

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| Analyte | Frequency of Detection[1] | Detected Analyte Concentration | Background Screening Value[2] | Federal MCL[3] | Florida GCTLs[4] | USEPA Region III RBCs[5] |
|---|---|---|---|---|---|---|
| **Inorganic Analytes (µg/ℓ)** | | | | | | |
| Aluminum | 0.5 | 330 | 654 | 200 | 200 S | 37,000 |

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] Background screening values are two times the arithmetic mean of detected background concentrations.
[3] Federal MCLs are maximum permissible concentrations of contaminants in water that are delivered to a user by a public water system.
[4] Source: Brownfields Cleanup Criteria Rule, Chapter 62-785, Florida Administrative Code.
[5] USEPA Region III RBC Table (October 1998).

Notes: Facilitywide groundwater has been identified as a separate site (Site 40) at NAS Whiting Field. This site will be addressed under a separate remedial investigation and feasibility study.

ARAR = applicable or relevant and appropriate requirements.
TBC = "to be considered" guidance material.
MCL = maximum contaminant level.
GCTL = groundwater cleanup target level.
USEPA = U.S. Environmental Protection Agency.
RBC = risk-based concentration.
µg/ℓ = micrograms per liter.
S = secondary drinking water standards based on Florida Administrative Code Rule 62-550.310 and 62-550..320

## Table 2-3
## Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Surface Soil at Site 12

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| Analyte | Frequency of Detection[1] | Range of Detected Analyte Concentration | Background Screening Value[2] | Soil Cleanup Target Level Residential/ Industrial[3] | USEPA Region III RBCs Residential/ Industrial[4] | Site-Specific soil Cleanup Goal[5] |
|---|---|---|---|---|---|---|
| **Inorganic Analytes (µg/ℓ)** | | | | | | |
| Arsenic | 6/6 | 2.4 to 3.8 | 3.2 | 0.8/3.7 | 0.43/3.8 | 4.62 |
| Vanadium | 6/6 | 12.5 to 26.8 | 21.8 | 15/7,400 | 55/1,400 | NA |

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] Background screening values are two times the arithmetic mean of detected background concentrations.
[3] Source: Brownfields Cleanup Criteria Rule, Chapter 62-777, FAC (June 1999) and the Petroleum Contamination Site Cleanup Criteria, Chapter 62-770, FAC (September 23, 1997).
[4] USEPA Region III RBCs for soil ingestion based on an excess lifetime cancer risk of $1 \times 10^{-6}$ or an adjusted hazard quotient of 0.1. (October 1998).
[5] Site-specific cleanup goal for arsenic based on information provided in Appendices A and B.

Notes: ARAR = applicable or relevant and appropriate requirement.
TBC = "to be considered" guidance material.
mg/kg = milligrams per kilogram.

site maintenance workers, occupational workers, and excavation workers based on exposure to surface soil at Site 12 via direct contact, ingestion, or inhalation of particulates are less than the USEPA target risk range and the FDEP risk threshold. The ELCR posed to residents based on the same exposure pathways and reasonable maximum exposure (RME) assumptions is $9\times10^{-6}$ due to arsenic. This value is within the acceptable USEPA risk range and greater than the FDEP risk threshold. Noncancer risks for the adult and child resident were within the acceptable USEPA and FDEP risk thresholds.

The human health assessment for Site 12 also considered adult and child residents exposed to surface soil at the site using central tendency, or average, exposure assumptions. This assessment indicated an ELCR of $1\times10^{-6}$, which is within the acceptable USEPA risk range and is acceptable to the FDEP. The range of ELCR presented by the RME and central tendency exposure scenarios (i.e., $1\times10^{-6}$ to $9\times10^{-6}$) provides the risk managers and decision makers with a perspective of the potential risk range presented by the site.

The ERA completed for Site 12 considered exposure of terrestrial plants, terrestrial invertebrates, and terrestrial wildlife to chemicals in surface soil at the site. The following is a summary of this assessment:

- The ERA for Site 12 identified one semivolatile organic compound (SVOC) (bis(2-ethylhexyl)phthalate), two inorganic analytes (aluminum and vanadium), and total recoverable petroleum hydrocarbons (TRPH) as ecological chemicals of potential concern (ECPCs).

- Risks were not identified for terrestrial wildlife resulting from exposure to ECPCs in surface soil; therefore, reductions in survivability, growth, and reproduction of wildlife receptor populations of Site 12 are not expected to occur.

- The results of the invertebrate toxicity testing (earthworm survival and growth tests) showed no acute or chronic toxicity to earthworms. Therefore, risks to terrestrial invertebrates are not anticipated. Although a reduction in lettuce seed germination was observed in two surface soil samples, there was no apparent correlation between any of the ECPC concentrations and observed responses. The site is overgrown, suggesting that native plant species are capable of surviving, growing and reproducing at Site 12.

- The results of the ERA suggest that risks are not predicted for ecological receptor populations at Site 12.

Because Site 12 and several other sites at NAS Whiting Field are disposal sites, the Navy requested that the FDEP consider a site-specific soil cleanup goal for arsenic. The Navy recommended a soil cleanup goal for arsenic at NAS Whiting Field disposal sites (Sites 1, 2, 9, 10, 11, 13, 14, 15, and 16) of 4.62 milligrams per kilogram. This request is included as Appendix A of this report.

The FDEP responded to this request in a letter dated April 27, 1998 (FDEP, 1998a). The FDEP concurred with the recommendation for the site-specific SCTL for arsenic at NAS Whiting Field disposal sites (Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, and 16), given the following conditions:

- In the future, the disposal sites will be used for activities that involve less than full-time contact with surface soil at the site. These activities could include parks, recreation areas, or agricultural sites.

- The Navy will incorporate these land-use considerations into a Land-Use Control (LUC) Agreement.

- The soil cleanup goal for arsenic will not be used at any other site without prior FDEP approval.

Based on the establishment of this site-specific cleanup goal for arsenic at Site 12, NAS Whiting Field, and as shown in Table 2-3, the establishment of a chemical-specific RAO for arsenic is not necessary if the above conditions are met. However, pending the future land use of Site 12 and a cost sensitivity analysis, varying levels of site cleanup may be required. Therefore, the following RAO has been established for Site 12:

**RAO 1:**
- Reduce human health risk associated with exposure to surface soil with arsenic concentrations greater than action levels.

These various action levels are listed in Table 2.3 and will be applied in accordance with pending land use.

Subsurface Soil. Chemical-specific ARARs and TBCs for subsurface soil were considered when identifying RAOs based on ARARs. The chemicals detected in subsurface soil at Site 12 were compared to the State SCTLs and to the USEPA RBCs for industrial sites, and no exceedences were noted. Based on this analysis, no RAOs will be developed for subsurface soil at Site 12.

Summary of RAOs. One RAO has been established for Site 12. Table 2-4 lists the RAO.

**Table 2-4**
**Summary of Remedial Action Objectives for Site 12**

Feasibility Study
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| Remedial Action Objectives | Description |
|---|---|
| 1 | Reduce human health risk associated with exposure to surface soil with arsenic concentrations greater than action levels. |

2.3 IDENTIFICATION OF GENERAL RESPONSE ACTIONS. General response actions describe potential medium-specific measures that may be employed to address RAOs. Potential response actions for CERCLA sites include the following general response categories:

- no action
- limited action
- containment
- treatment (either *in situ* or *ex situ*)
- disposal

# 3.0 REMEDIAL ACTION ALTERNATIVES

The approach and rationale leading to the development of remedial alternatives for Site 12 are presented in this chapter. The development of remedial alternatives for CERCLA sites consists of identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial alternatives that accomplish the RAO identified in Chapter 2.0.

The NCP requires that a range of remedial alternatives be considered. SARA emphasizes the use of treatment technologies. Treatment alternatives range from those that eliminate the need for long-term management to those that reduce toxicity, mobility, or volume of contaminants. The range of alternatives considered in this FS include technologies from the following categories:

- no action
- limited action
- containment
- treatment
- disposal

The NCP and USEPA provide guidance for developing remedial alternatives (USEPA, 1991). Section 300.430[a][1][iii][B] of the NCP states that the USEPA expects containment technologies will generally be appropriate for waste (e.g., landfills) that poses a relatively low long-term threat or where treatment is impractical. In this FS, the number of technologies and alternatives evaluated for Site 12 were limited in scope based on these guidance documents.

Additionally, the USEPA states in this guidance document that treatment technologies should be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (i.e., "hot spots"). The RI for this site did not identify any hot spots; therefore, the treatment technologies and alternatives were not identified for Site 12.

The remaining sections of this chapter identify the types of technologies that contribute to achieving the RAO, evaluate and select representative technologies for each technology type, and develop remedial alternatives using the selected technologies. A detailed evaluation of remedial alternatives is presented in Chapter 4.0.

3.1 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES FOR SITE 12. The purpose of this section is to identify and screen appropriate technologies for assembly into remedial alternatives that address the RAO identified for Site 12. Each technology is then screened based on site- and waste-limiting characteristics.

Site characteristics considered during this process included the following:

- site geology, hydrogeology, and terrain;
- availability of space and resources necessary to implement the technology; and

- presence of special site features (e.g., wetlands, floodplains, or endangered species).

The following waste characteristics were also considered:

- contaminated media,
- types and concentrations of waste constituents, and
- physical and chemical properties of the waste (e.g., volatility, solubility, and mobility).

Table 3-1 presents the remedial technologies applicable for addressing the RAO for Site 12. This table also presents the screening of those technologies. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site- and waste-limiting factors. Technologies deemed ineffective or not implementable were eliminated from further consideration. The remaining technologies are assembled into remedial alternatives in Section 3.2.

3.2 REMEDIAL ALTERNATIVES FOR SITE 12. Remedial technologies that passed the technology screening are assembled into alternatives that will meet the RAO. Table 3-2 presents the alternative development for Site 12. The alternatives for Site 12 were developed to address closure of the disposal area in accordance with ARARs.

Although the soil mounds at Site 12 are not considered hot spots (or areas with elevated contaminant concentrations), and no RAO was established for treatment or disposal of the soil mounds, the mounds are a potential physical hazard. When coupled with LUCs, disposal of the soil mounds was considered to be a possible alternative for Site 12.

Based on the applicable technologies identified in the preceding section, three remedial alternatives were developed for Site 12. These alternatives are options under the no action, limited action, and disposal general response categories. The no action alternative was developed to provide a baseline for comparison with other alternatives (USEPA, 1988). The alternatives developed for Site 12 are discussed in the following subsections.

3.2.1 Alternative 1: No Action The NCP requires the development of the no action alternative to provide a baseline for comparison against other remedial alternatives. This alternative (i.e., Alternative 1) does not involve the implementation of any remedial technologies to treat wastes at Site 12. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. The 5-year site review typically involves an administrative review of site records. For cost estimating purposes, Alternative 1 would include 5-year reviews for a period of 30 years.

3.2.2 Alternative 2: Land-Use Controls Alternative 2 consists of activities necessary to maintain LUCs at the Site 12 disposal area. These activities are

- LUCs (i.e. LUC documents), and

## Table 3-1
## Identification and Screening of Remedial Technologies for Site 12

Feasibility Study
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| General Response Action and Technology | Description of Technology | Applicability to: | | Screening Status |
|---|---|---|---|---|
| | | Site Characteristics | Waste Characteristics | |
| **No Action** | | | | |
| No action | No remedial actions are taken at Site 12. Five-year site reviews would be required. | Applicable. | Applicable. | Retained. This alternative is retained for a baseline for comparison with other alternatives as required by CERCLA. |
| Five-year site reviews | Under CERCLA, if wastes are left on a site after closure, the site should be reviewed every 5 years. | Applicable. | Applicable. | Retained. This alternative is retained based on the CERCLA requirement that if wastes remain on site after closure, a review of the site must be completed every 5 years. |
| **Limited Action** | | | | |
| Land-use controls (LUC) | Use of LUC documents to maintain the site for non-residential purposes. | Applicable. | Applicable. | Retained. This alternative is retained because it would achieve RAO 1. |
| **Containment** | | | | |
| Soil covering and related activities | A cover material (i.e. clay, soil, asphault, gravel, or synthetic membrane) is placed over the site. Provides a barrier preventing receptor contact with Site 12 soil. | Applicable. | Applicable. | Eliminated. This technology would be difficult to implement due to the mounded waste. |

See notes at end of table.

## Table 3-1 (Continued)
## Identification and Screening of Remedial Technologies for Site 12

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
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| General Response Action and Technology | Description of Technology | Applicability to: | | Screening Status |
|---|---|---|---|---|
| | | Site Characteristics | Waste Characteristics | |
| **Containment (Continued)** | | | | |
| Soil stabilization | Soils are mixed with an additive, such as a reactive chemical or concrete, to bind specific analytes chemically or physically with soil particles. This technology eliminates migration of contaminants from soil. The process can be performed *in situ* or *ex situ*. | Applicable. | Applicable. | Eliminated. This alternative would not achieve the RAO, and significant arsenic migration from Site 12 is not expected. |
| **Disposal** | | | | |
| Off-Site Soil Disposal: | | | | |
| RCRA Subtitle D Solid Waste Landfill | Removed soil is sampled and analyzed for waste classification. Soil is transported to a nonhazardous, solid waste landfill based on analytical results from excavated soil. | Applicable. Soil is most likely not characteristically ignitable, corrosive, reactive, or toxic. | Applicable. Analytical results from the RI indicate that the soil would most likely not be classified as hazardous for toxicity. | Retained. |
| RCRA Subtitle C Hazardous Waste Landfill | Excavated soil is sampled and analyzed for waste classification. Soil is transported to a hazardous, solid waste landfill based on analytical results from excavated soil. | Not Applicable. Soil is most likely not characteristically ignitable, corrosive, reactive, or toxic. | Not Applicable. Analytical results from the RI indicate that the soil would most likely not be classified as hazardous for toxicity. | Eliminated. It was assumed that soil at Site 12 would be classified as nonhazardous. |

Notes: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
RAO = remedial action objective.
RCRA = Resource Conservation and Recovery Act.
RI = remedial investigation.

- 5-year site reviews.

LUCs, such as documents that restrict the use of the land in the vicinity of a disposal area and place regulatory controls on excavation of soil, would be drafted, implemented, and enforced in compliance with local regulations as a part of this alternative. The LUCs would be placed on the parcel of land encompassing the disposal site, including a typical buffer zone, as is currently used at other sites in the state.

Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years.

**Table 3-2**
**Development of Remedial Alternatives for Site 12**

Feasibility Study
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| Alternative | Description of Key Components |
|---|---|
| **Alternative 1:** No Action | Five-year site review. |
| **Alternative 2:** Land-Use Controls (LUCs) | LUCs including LUC assurance and implementation plans.<br>Five-year site review. |
| **Alternative 3:** Soil Disposal and LUCs | LUCs including LUC assurance and implementation plans.<br>Posting of warning signs.<br>Clearing and grubbing of disposal area.<br>Disposal of soil mounds.<br>Site restoration.<br>Five-year site review. |

3.2.3 Alternative 3: Soil Disposal and LUCs One disposal alternative developed for Site 12 consists of all components of Alternative 2 with the addition of off-site disposal of the soil mounds.

Prior to soil disposal, a portion of the site would be cleared and grubbed to allow access to the soil mounds. One composite sample would be collected from the soil mounds to characterize the soil for off-site disposal. After the soil mounds were taken to off-site disposal areas, 6 inches of topsoil would be placed on top of the excavated areas. Once in place, the soil layer would be seeded.

In addition, LUCs and 5-year reviews would be implemented as previously discussed. The 5-year site review would assess the need for continued monitoring.

# 4.0 DETAILED ANALYSIS OF ALTERNATIVES

This chapter presents detailed analyses of alternatives for Site 12 at NAS Whiting Field. A detailed analysis is performed to provide decision makers with sufficient information to select the appropriate remedial alternative for a site. The detailed analysis has been conducted in accordance with CERCLA Section 121, the NCP, and USEPA RI/FS guidance (USEPA, 1988). The detailed evaluation of each remedial alternative includes the following:

- a detailed description of the alternative, emphasizing the applications of the technology or actions proposed for each alternative; and
- a detailed analysis of the alternative against seven of the nine criteria.

The remedial alternatives are examined with respect to the requirements stipulated by CERCLA and factors described in the USEPA's *Guidance for Conducting RI/FS Under CERCLA* (USEPA, 1988). The nine criteria from the RI/FS guidance document are

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume of contaminants through treatment;
- short-term effectiveness;
- implementability;
- cost;
- State acceptance; and
- community acceptance.

This FS presents evaluation of the first seven criteria in the alternative evaluation process. Table 4-1 outlines the specific elements considered for these seven criteria.

Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the final FS, and a summary of State acceptance of this FS will be included in the final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

**4.1 DETAILED ANALYSIS FOR ALTERNATIVE 1: NO ACTION**. Alternative 1 is a no action alternative. Under this alternative, no actions would be taken to address contamination at the site. A description of this alternative is presented in Subsection 4.1.1, and a technical assessment of this alternative is presented in Subsection 4.1.2.

## Table 4-1
## Factors for Detailed Analysis of Remedial Alternatives

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
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| Factors | Criteria to Consider |
|---|---|
| Overall protection of human health and the environment | How risks are eliminated, reduced, or controlled.<br>Short-term or cross-media effects. |
| Compliance with ARARs | Compliance with chemical-specific ARARs.<br>Compliance with location-specific ARARs.<br>Compliance with action-specific ARARs. |
| Long-term effectiveness and permanence | Magnitude of residual risk.<br>Adequacy of controls.<br>Reliability of controls. |
| Reduction of mobility, toxicity, and volume of contaminants through treatment | Treatment process and remedy.<br>Amount of hazardous materials destroyed or treated.<br>Reduction of mobility, toxicity, or volume through treatment.<br>Irreversibility of treatment.<br>Type and quantity of treatment residual. |
| Short-term effectiveness | Protection of community during remedial action.<br>Protection of workers during remedial action.<br>Environmental effects.<br>Time until RAOs are achieved. |
| Implementability | Ability to construct technology.<br>Reliability of technology.<br>Ease of undertaking additional remedial action, if necessary.<br>Coordination with other agencies. |
| Cost | Capital cost.<br>Operation and maintenance cost.<br>Total present worth of alternative. |

Notes: ARAR = applicable or relevant and appropriate requirement.
RAO = remedial action objective.

4.1.1 **Detailed Description of Alternative 1** In accordance with the NCP, the no-action alternative is used as a baseline for comparison against other alternatives. Because hazardous substances, pollutants, or contaminants would be left in place at Site 12 as part of this alternative, this alternative would include 5-year site reviews. There would be no restrictions on land-use types; therefore, the site could be used for residential use or other high-exposure uses.

Five-Year Site Reviews. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. It is assumed, for this FS, that these reviews would occur over a 30-year period. These reviews would consist of evaluating changes to site conditions at the site (e.g., construction, demolition, change in potential receptors, migration pathways, qualitative risks, etc.) to assess whether or not human health and the environment continue to be protected by the alternative. The appropriateness of this alternative would then be compared to other remedial alternatives to confirm that it is still the most appropriate selection.

4.1.2 **Technical Criteria Assessment of Alternative 1** This subsection provides the technical criteria assessment of Alternative 1 against the seven criteria.

Overall Protection of Human Health and the Environment. This alternative would provide no additional protection to human receptors who may be exposed to soils at Site 12. If this alternative were selected, 5-year site reviews would be instituted.

No adverse short-term or cross-media effects are anticipated with this no-action alternative.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida GCTLs, or Florida SCTLs) in the short term. Eventually, this alternative may comply with ARARs if natural processes including physical, chemical, and biological changes in the soil and groundwater reduce contaminant concentrations.

Long-Term Effectiveness and Permanence. LUCs are not a part of the alternative; therefore, human risks due to exposure to site soils would not be addressed via this alternative. Therefore, these risks would remain over a period of time until natural processes reduce the contaminant concentrations and reduce the mobility of the contaminants, or other LUCs are implemented.

Administrative actions proposed in this alternative (e.g., 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative, but would not provide a permanent remedy for the site. Administrative actions are considered to be reliable controls.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. This alternative would not provide a reduction in contaminant toxicity, mobility, or volume because no active mitigation of contaminant concentrations is proposed. No treatment residuals would be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would not reduce human health risks in the short term because no land-use restrictions would be implemented.

This alternative does not pose a threat to workers through exposure to contaminated soils because remedial construction activities are not proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 1 is presented in Table 4-2. The 5-year site reviews were estimated over a 30-year monitoring period. A 30-year period was chosen only because the RI/FS guidance recommends using this time frame. The total present worth cost of Alternative 1 is $19,000. Cost estimates are presented in Appendix C.

**Table 4-2**
**Cost Summary Table, Alternative 1: No Action**

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| | |
|---|---|
| **Operation and Maintenance Cost (O&M) (per event)** | |
| 5-year site review | $5,000 |
| Total O&M cost (per event) | $5,000 |
| Total O&M cost (present worth of semiannual O&M for 30 years) | $17,000 |
| Contingency (10%) | $2,000 |
| Total cost Alternative 1: No Action | $19,000 |

Note: % = percent.

4.2 DETAILED ANALYSIS FOR ALTERNATIVE 2: LAND-USE CONTROLS. Alternative 2 consists of administrative actions to limit the exposure to soils at Site 12. A description of this alternative is presented in Subsection 4.2.1, and a technical assessment of this alternative is presented in Subsection 4.2.2.

4.2.1 Detailed Description of Alternative 2 Under this alternative, LUCs would be implemented that would provide protection of human receptors. These LUCs would involve the use of institutional controls that would restrict the use of the land in the vicinity of Site 12. The agreement would mandate an ongoing inspection program to ensure compliance while the LUCs are in effect. Additionally, LUCs would place regulatory controls on the excavation of soils or similar activities that have the potential to disturb the site soils or increase the likelihood of exposure to the site soils. The LUCs would be placed on a parcel of land slightly larger than the boundaries of the current disposal area. This would ensure that an appropriate buffer zone is created and maintained between the disposal area and other areas of NAS Whiting Field.

The following components would be included as part of this alternative:

- LUCs, and
- 5-year site reviews.

LUCs. Under new USEPA Region IV guidance, the use of LUCs as a remedy for contaminated sites requires the development of an LUC assurance plan (LUCAP) and an LUC implementation plan (LUCIP). These two documents detail the actions required when LUCs are selected as a remedy for a site.

The LUCAP is developed for the entire facility on which LUCs are necessary. In this case, an LUCAP would be developed for NAS Whiting Field. This document would identify an individual at the facility who is responsible for ensuring that no activities occur at a site where LUCs are necessary that would violate what has been specified in the LUCs.

The LUCIP is then developed for each site where LUCs are necessary on the facility. The LUCIP would include details regarding additional required activities, such as quarterly and annual inspection, and reporting for the specific area. These activities are required as part of the LUC agreement to ensure compliance while the LUCs for the sites are in effect. Further, because LUCs will remain in effect until the contamination at the sites has been adequately addressed, the activities identified in the LUCIP will also remain in effect until such time that the contamination present at the sites has been adequately addressed.

5-Year Site Reviews. Refer to Subsection 4.1.1 for a detailed description of these reviews.

**4.2.2 Technical Criteria Assessment of Alternative 2** This subsection presents the technical criteria assessment of Alternative 2.

Overall Protection of Human Health and the Environment. Human receptors, namely residents, would be protected if this alternative were implemented. Regulatory controls (i.e., LUCs) would prohibit potential future residents from exposure to the site because residential use of the site would be restricted under the proposed LUCs.

By implementing this alternative, no adverse short-term or cross-media effects are anticipated.

Compliance with ARARs. This alternative would comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida GCTLs, or Florida SCTLs). Concentrations of contaminants are less than their respective industrial SCTLs or site-specific cleanup goals, as discussed in Chapter 2.0.

Long-Term Effectiveness and Permanence. The risks presented to the future resident based on exposure to surface soil at the site would be addressed via the LUCs. The long-term effectiveness and permanence of these controls will be managed by the facility under the LUCAP developed for NAS Whiting Field.

Administrative actions proposed in this alternative (e.g., LUCs and 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative. These administrative actions are considered to be reliable controls, as long as the facility maintains its LUCAP and LUCIP.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Although no treatment is included in this alternative, this alternative may provide some reduction in contaminant toxicity through natural processes.

However, this alternative would not provide a reduction in contaminant mobility or volume because no active mitigation of contaminant mobility or reduction in volume is proposed. No treatment residuals would be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would reduce human health risks in the short term by reducing the potential exposure to Site 12 soils by human receptors.

This alternative does not pose a threat to workers through exposure to contaminated soils because only limited remedial construction activities (e.g., posting signs) are proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as LUCs and 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 2 is presented in Table 4-3. Both the LUCs and 5-year site reviews were costed out over a 30-year monitoring period. A 30-year period was chosen only because that is what the RI/FS guidance recommends. The total present worth cost of Alternative 2 is $135,000. Cost estimates are presented in Appendix C.

**Table 4-3**
**Cost Summary Table, Alternative 2: Land-Use Controls**

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| | | |
|---|---|---|
| **Direct Cost** | | |
| Land-use controls (LUCs) | | $12,000 |
| | Total direct cost | $12,000 |
| **Operation and Maintenance Cost (O&M) (per event)** | | |
| 5-year site review | | $ 5,000 |
| Inspection/Reporting (LUC installation plan compliance) | | $7,000 |
| | Total O&M cost (per event) | $ 12,000 |
| | Total O&M cost (present worth of semiannual O&M for 30 years) | $111,000 |
| | Total Direct and O&M | $123,000 |
| | Contingency (10%) | $12,000 |
| | Total cost Alternative 2: Land-Use Controls | $135,000 |

uNote: % = percent.

4.3 DETAILED ANALYSIS FOR ALTERNATIVE 3: SOIL DISPOSAL AND LUCS. Alternative 3 consists of disposal of the soil mounds at Site 12, and the implementation of LUCs. A description of this alternative is presented in Subsection 4.3.1, and a technical criteria assessment of this alternative is presented in Subsection 4.3.2.

4.3.1 **Detailed Description of Alternative 3** Alternative 3 is designed to address RAO 1, and the physical hazard of the soil mounds at Site 12. It includes the following components:

- site preparation
- waste characterization
- soil removal and disposal
- site restoration
- LUCs
- 5-year site reviews

Site Preparation. The topography of Site 12 is a moderate (approximately 12 degree) slope to the south. Hardwoods, shrubs, and other vegetation will be cleared with a backhoe or other type of excavation equipment as necessary to provide access to the soil mounds. Small brush and vegetation will be chopped and spread over the disposal area surface. Large trees will be disposed of as yard-waste at an appropriate mulching or tree recycling facility.

Waste Characterization. One composite waste characterization sample will be taken and analyzed prior to removal activities. Based on the RI, it is expected that the results of the sample will allow for disposal at a Resource Conservation and Recovery Act Subtitle D (Solid Waste) Landfill.

Soil Removal. The soil (48 cubic yards [$yd^3$]) will be removed with a backhoe and loaded immediately into rolloffs or dumptrucks. Excavated soil will then be transported to a local landfill.

Site Restoration. A 6-inch layer of soil (5 $yd^3$) will be placed over the excavated areas to support vegetative growth. The soil will be obtained from an off-site borrow source to provide the adequate soil composition required to stimulate and support natural vegetation. The soil will be analyzed for target compound list volatile organic compounds, SVOCs, pesticides and polychlorinated biphenyls, target analyte list inorganic analytes, and TRPH and checked for pH to verify that it is "clean" fill and exhibits a pH between 6 and 7.5.

Selected seed and fertilizer will be placed on the vegetative support layer to establish vegetation. Hay will be used to protect the seed and fertilizer during initial development.

LUCs. Refer to Alternative 2 for a description.

5-year site reviews. Refer to Alternative 2 for a description.

4.3.2 **Technical Criteria Assessment of Alternative 3** This subsection presents the technical criteria assessment of Alternative 3.

Overall Protection of Human Health and the Environment. Overall protection of human health and the environment would be achieved by the implementation of Alternative 3. LUCs would prohibit potential human receptors from coming into contact with the soils at Site 12, and the physical hazard of the soil mounds would be removed.

Compliance with ARARs. This alternative would comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida GCTLs, or Florida SCTLs). Concentrations of

contaminants are less than their respective industrial Florida SCTLs or site-specific cleanup goals, as discussed in Chapter 2.0.

Worker safety standards will be maintained during removal activities to comply with ARARs. A site-specific health and safety plan will be developed and implemented during all site activities.

Five-year site reviews will be prepared to assess the effectiveness of the alternative.

Long-Term Effectiveness and Permanence. The risks presented to the future resident based on exposure to surface soil at the site would be addressed via the LUCs. The long-term effectiveness and permanence of these controls will be managed by the facility under the LUCAP developed for NAS Whiting Field.

Administrative actions proposed in this alternative (e.g., LUCs and 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative. These administrative actions are considered to be reliable controls, as long as the facility maintains its LUCAP and LUCIP.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Alternative 3 does not include treatment of contaminants and does not physically or chemically alter contaminants in soil at the site. However, this alternative does reduce the volume (approximately 48 $yd^3$) of contaminants on site because the contaminated soil would be taken off site for disposal.

Short-Term Effectiveness. During the clearing, grubbing, and grading of the site, fugitive dust will be generated. Based on the RI, the short-term risk to site workers should be minimal.

Site workers will be exposed to increased risks by dermal contact, ingestion, and inhalation during removal activities. Appropriate personal protective equipment can be used to minimize this increased risk.

Implementability. Equipment and materials are readily available to remove the soil for Alternative 3. Site work will be completed within a 5-day period and will require standard removal expertise. The small quantity of soil necessary to sustain the vegetative cover is available locally. Other activities, such as LUCs and 5-year site reviews, are easily implemented.

Cost. The cost estimate for Alternative 3 is presented in Table 4-4, and detailed cost calculations are provided in Appendix C. This estimate is based on the preliminary design criteria presented in this section. The total present worth cost of Alternative 3 is approximately $202,000.

## Table 4-4
## Cost Summary Table, Alternative 3: Off-Site Disposal

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| | | |
|---|---|---|
| **Direct Cost** | | |
| Mobilization | | $7,000 |
| Site preparation | | $5,000 |
| Site clearing and grubbing | | $3,000 |
| Soil sampling | | $6,000 |
| Vegetative support layer | | $1,000 |
| Loading and off site soil disposal | | $17,000 |
| Site restoration | | $2,000 |
| Land-use controls | | $12,000 |
| | Total direct cost | $53,000 |
| **Indirect Cost** | | |
| Health and safety (3%) | | $1,500 |
| Administration and permitting (3%) | | $1,500 |
| Engineering and design (10%) | | $5,000 |
| Construction support services (10%) | | $5,000 |
| | Total indirect cost | $13,000 |
| | Total capital cost (direct + indirect) | $66,000 |
| **Operation and Maintenance (O&M) Cost (per event)** | | |
| Land-use controls (inspection and reporting) | | $12,000 |
| 5-year site review | | $5,000 |
| | Total O&M Cost (present worth of annual O&M for 30 years) | $123,000 |
| | Total direct and O&M costs | $189,000 |
| | Contingency (10%) | $18,000 |
| | Total cost Alternative 3: Off-Site Disposal | $207,000 |

Note: % = percent.

# 5.0 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial alternatives for Site 12 were developed in Chapter 3.0 and were individually evaluated in Chapter 4.0 using seven technical criteria. For comparative purposes, these criteria are grouped into the following categories:

- threshold criteria,
- primary balancing criteria, and
- modifying criteria.

The remainder of this chapter presents a comparison of remedial alternatives with respect to these criteria. This comparison is intended to provide technical information required to support the selection of a preferred alternative for Site 12.

5.1 OVERALL APPROACH TO COMPARATIVE ANALYSIS. As presented in Chapter 4.0, remedial alternatives were developed to accomplish the RAO identified for the site. The three sets of criteria identified above are used to streamline the comparison between alternatives while ensuring compliance with the RAO. Components of these criteria are described below.

5.1.1 Threshold Criteria Because the selected remedy must be protective of human health and the environment, as well as comply with ARARs, the following two threshold criteria are essential:

- overall protection of human health and the environment, and
- compliance with ARARs.

An individual assessment of each alternative with respect to these criteria was presented in Chapter 4.0. An overall comparative analysis of alternatives using threshold criteria is presented in Section 5.2.

5.1.2 Primary Balancing Criteria Primary balancing criteria consist of the following five components:

- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume of contaminants through treatment;
- short-term effectiveness;
- implementability; and
- cost.

These criteria are used to provide an assessment of the permanence of each remedial alternative, while ensuring their implementability and cost-effectiveness. An individual assessment of each alternative with respect to these criteria is presented in Chapter 4.0. An overall comparative analysis of alternatives using primary balancing criteria is presented in Section 5.2.

5.1.3 Modifying Criteria The final two criteria are as follows:

- State acceptance, and

- community acceptance.

Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the final FS, and a summary of State acceptance of this FS will be included in the final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

Based on this information, an evaluation of modifying criteria is not included in this FS.

5.2 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR SITE 12. This section provides the comparative analysis for remedial alternatives for Site 12 with respect to the criteria described in Section 5.1.

5.2.1 Comparison of Threshold Criteria The remedial alternatives for Site 12 were first compared to the two threshold criteria: overall protection of human health and the environment and compliance with ARARs.

Alternative 1 does not provide a means of restricting future land use of the area. Therefore, this alternative does not protect potential future residents from environmental conditions at the site. Alternative 1 would not achieve the RAO established for Site 12.

The implementation of Alternative 2 would provide a measure of continued protection of human health and the environment because the alternative includes LUCs (including an LUCIP and LUCAP). In this manner, Alternative 2 would achieve the RAO established for the site and would also achieve ARARs.

Alternative 3 would also achieve ARARs and the RAO established for Site 12 and would remove the soil mounds from the site.

5.2.2 Comparison of Primary Balancing Criteria The primary balancing criteria emphasize long-term effectiveness and permanence and reduction in mobility, toxicity, and volume of contaminants through treatment. Although Alternative 3 would reduce the volume of contaminated soil at Site 12, the reduction would not be significant. All the alternatives evaluated for Site 12 would not reduce the toxicity or mobility of contaminants at the site because none of the alternatives involve treatment of contaminants in media at the site.

The implementability of Alternative 2 or 3 would be comparatively easy. However, an LUCAP and LUCIP would need to be developed. The documents should be easy to complete, but implementation of the LUCs may be extended until agreement is reached among the regulatory agencies as to the format for these documents at NAS Whiting Field.

5.2.3 Modifying Criteria As stated in Subsection 5.1.3, an evaluation of modifying criteria will not be included in this FS.

## REFERENCES


ABB Environmental Services, Inc. (ABB-ES). 1998. *Remedial Investigation for Site 12, Tetraethyl Lead Disposal Area, Naval Air Station Whiting Field, Milton, Florida.* Prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), North Charleston, South Carolina (April).

Envirodyne Engineers, Inc. 1985. *Initial Assessment Study, Naval Air Station Whiting Field, Milton, Florida.* Prepared for Naval Energy and Environmental Support Activity, Port Hueneme, California.

Florida Department of Environmental Protection (FDEP). 1994. *Florida Ground Water Guidance Concentrations*, Division of Water Facilities, Bureau of Ground Water Protection (June).

FDEP. 1997. *Petroleum Contamination Site Cleanup Criteria, Chapter 62-770, Florida Administrative Code (FAC).*

FDEP. 1998a. Letter dated April 27, 1998. Response to report by Navy (see Appendix A).

FDEP. 1998b. *Brownfields Cleanup Criteria Rule, Chapter 62-785, FAC.* (July).

Harding Lawson Associates. 1998. *Remedial Investigation and Feasibility Study, General Information Report, Naval Air Station Whiting Field, Milton, Florida.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

U.S. Department of Agriculture. 1980. *Soil Survey of Santa Rosa County, Florida.* Soil conservation Service. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.* Office of Solid Waste and Emergency Response. Washington, D.C. (October).

USEPA. 1991. *Streamlining the RI/FS for CERCLA Municipal Landfill Sites.* Washington, D.C.

USEPA. 1992. *Draft Technical Manual for Solid Waste Disposal Facility Criteria.*

USEPA. 1998. Region III Risk-Based Concentration Table (October).

# APPENDIX A

# NAVY'S REQUEST FOR SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC AT DISPOSAL SITES AT NAS WHITING FIELD

**Evaluation of Background Arsenic Concentrations for Covered Landfill Sites**

**Naval Air Station (NAS) Whiting Field, Milton, Florida**

At NAS Whiting Field nine soil types, as identified by the U. S. Department of Agriculture, Soil Conservation Service (USSCS), are present. The Remedial Investigation (RI) sites at NAS Whiting Field are associated with seven of the nine soil types. The background surface soil data set for each RI site was initially determined to be comprised of background surface soil samples from the same USSCS soil types as occur on the individual sites. However, available information and review of historical aerial photographs indicated that in the construction of landfills at the facility, a borrow pit was dug to an approximate depth of 10 to 15 feet below land surface (bls) and the excavated soil was piled to the side. Following landfill operations, the borrow materials comprised of undifferentiated surface and subsurface soils, were used for the landfill cover. Any additional soils required to complete the landfill cover are believed to have been obtained from other borrow pits located at the facility.

If a mix of surface and subsurface soils were used in the cover for landfills, it would be appropriate to use the combined data set of surface and subsurface soil samples as the background screening value. However in order to be protective of human health and the environment, it is proposed that the background surface and subsurface data set be combined to a single value as be used as the "Industrial Use Soil Cleanup Goal". This modified "Industrial Use Soil Cleanup Goal" is specifically limited to the covered landfill sites including: Site 1, 2, 9, 10, 11, 13, 14, 15, and 16 and to the inorganic analyte arsenic.

Tables 3-8 through 3-18 in the General Information Report present the detected concentrations and summarize the analytical data for the individual background soil samples collected at NAS Whiting Field. A summary of the arsenic background data set and the modified "Industrial Use Soil Cleanup Goal" for arsenic is presented Table I-1. As indicated on the table the modified "Industrial Use Soil Cleanup Goal" for arsenic to be used at covered landfill sites is 4.62 mg/kg.

## Table A-1
## Summary of Arsenic Detected in Surface and Subsurface Background Soil Samples

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| Analyte | Frequency of Detection Surface Soil Samples[1] | Mean of Detected Concentrations Surface Soil Samples[2] | Frequency of Detection Sub-surface Soil Samples[1] | Mean of Detected Concentrations Subsurface Soil Samples[2] | Frequency of Detection Surface and Subsurface Soil Samples[1] | Mean of Detected Concentrations Surface and Subsurface Soil Samples[2] | Surface and Subsurface Soil Background Screening Concentration (modified Industrial Use Cleanup Goal) |
|---|---|---|---|---|---|---|---|
| **Inorganic Analytes (mg/kg)** | | | | | | | |
| Arsenic | 15/15 | 1.54 | 14/14 | 3.14 | 29/29 | 2.31 | 4.62 |

[1] Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed.
[2] The mean of detected concentrations is the arithmetic mean of all samples in which the analyte was detected. It does not include those samples in which the analyte was not detected.

Note: mg/kg = milligrams per kilogram.

## Table A-2
## Comparison of Detected Arsenic Concentrations in Surface and Subsurface Soil Samples to Florida Soil Cleanup Goals

Feasibility Study
Site 12, Tetraethyl Lead Disposal Area
Naval Air Station Whiting Field
Milton, Florida

| Analyte | Minimum Detected Concentration | Maximum Detected Concentration | Mean of Detected Concentrations | Soil Cleanup Target Levels for Florida (Residential)[1] | Soil Cleanup Target Levels for Florida (Industrial)[1] | Surface and Subsurface Soil Background Screening Concentration (modified Industrial Use Cleanup Goal)[2] |
|---|---|---|---|---|---|---|
| **Inorganic Analyte (mg/kg)** | | | | | | |
| Arsenic | 0.52 | 6.3 | 2.31 | 0.8 | 3.7 | 4.62 |

[1] Source: Chapter 62-785, Florida Administrative Code.
[2] The modified Industrial Use Cleanup Goal for arsenic is the Florida Department of Environmental Protection approved site specific cleanup gaol for Perimeter Road sites at Naval Air Station, Whiting Field.

Note: mg/kg = milligrams per kilogram.

# APPENDIX B

## FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION'S RESPONSE AND ACCEPTANCE OF THE SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC FOR DISPOSAL SITES AT NAS WHITING FIELD

# Department of Environmental Protection

wton Chiles
Governor

Twin Towers Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

April 27, 1998

Ms. Linda Martin
Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, PO Box 190010
North Charleston, SC 29419-9010

file: arsenic1.doc

RE: Request for Site-Specific Arsenic Soil Cleanup Levels: Covered Landfill Sites, NAS Whiting Field

Dear Ms. Martin:

I have reviewed the request for approval of a site-specific Soil Cleanup Goal for arsenic at the "covered landfill sites" at NAS Whiting Field from Mr. Gerald Walker, ABB Environmental Services, dated April 22, 1998 (received April 22, 1998). Based on the prior presentation to Department Staff and the summary information furnished in the letter and the attached Appendix I, the request is granted to utilize a site-specific Soil Cleanup Goal for arsenic of 4.62 mg/kg at Sites 1, 2, 9, 10, 11, 12, 13, 14, 15 and 16., with the following conditions:

1. The sites may be utilized for activities that involve less than full-time contact with the site. This may include, but is not limited to, a.) parks b.) recreation areas that receive heavy use (such as soccer or baseball fields) or, c.) agricultural sites where farming practices result in moderate site contact (approximately 100 days/year, or less).

2. The Navy must assure adherence to the land use by incorporating the site and conditions in a legally binding Land Use Contol agreement.

3. The above Soil Cleanup Goal shall not be utilized at any other site without specific Department approval.

If you have questions or require further clarification, please contact me at (904) 921-4230.

Sincerely,

James H. Cason, P.G.
Remedial Project Manager

# APPENDIX C

## COST AND VOLUME CALCULATIONS FOR REMEDIAL ALTERNATIVES

| PROJECT | COMP. BY | JOB NO. |
|---|---|---|
| Whiting Field Site 12 FS | MBC | 2534.0.13 |
| VOLUME CALCULATIONS | CHK. BY | DATE |
| | | 6/30/98 |

Objective

Find the Amount of of Soil in the six sludge mounds at site 12.

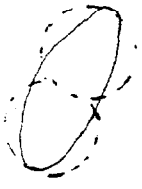
Assumptions:

1. Mounds are 3-5' in height (Larger footprint being taller)
2. The shape of the mounds is Accurately drawn on Figure 2-1 of the RI.
3. The mounds are uniform, Regular and can be estimated using cones or pyramids.

1" = 20'

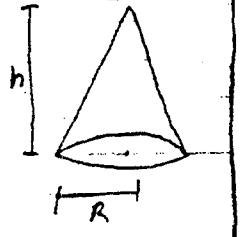
Mound E  radius ≅ 5' h = 3' $V_E$ = 78.5 ft³ ✓

Mound D  radius ≅ 7' h = 5' $V_D$ = 256.5 ft³ ✓

Mound C  radius¹ ≅ 5' radius² ≅ 5' h¹ = 4' h² = 4' $V^1$ = 105 ft³ ✓ $V^2$ = 105 ft³ ✓ $V^1 + V^2$ = 210 ft³ = $V_C$ ✓

Mound X  radius ≅ 4.5' h = 3' $V_X$ = 64 ft³ ✓

Volume Cone




$$V = \frac{\pi R^2 h}{3}$$

| PROJECT | COMP. BY | JOB NO. |
|---|---|---|
| Whiting Field Site 12 FS VOLUME CALCULATIONS | MBC | 2534.41 X12 |
| | CHK BY | DATE 6/30/06 |

6/3/99

Mound B

$V = (\pi r^2 h)/3$

radius$^1 \cong 7'$

radius$^2 \cong 6'$

$h^1 = 5'$

$h^2 = 4'$

$V^1 = 257$ ~~$Ft^3$~~ ✓

$V^2 = 151$ $Ft^3$ ✓

$V^1 + V^2 =$ ~~367.5~~ 408 $Ft^3 = V_B$

Mound A

radius$^1 = 6'$

radius$^2 = 6'$

$h^1 = 4'$

$h^2 = 4'$

$V^1 = 151$ $Ft^3$

$V^2 = 151$ $Ft^3$

$V^1 + V^2 = 302$ $Ft^3$ ✓ $= V_A$

Total Volume of Soil $V_T = V_A + V_B + V_C + V_D + V_E + V_x$

$V_T = 302 + \overset{408}{\cancel{367.5}} + 210 + 256.5 + 78.5 + 64 =$

$V_T =$ $\overset{1319}{\cancel{1278.5}}$ $Ft^3 =$ $\overset{48.85}{\cancel{47.35}}$ $yd^3$ ✓

NOTE: Foot print of Cones was made larger than the Foot print of the piles in all cases. The total volume should be a slight overestimate of the actual volume.

→ Assuming 20% compaction

$V_T = 48.85 \times 1.2 = 58.6\ yd^3$ AA

$W_T = 58.6 \times 1.2 \cong$ ~~80~~ 70 tons AA

## ALTERNATIVE #1: NO ACTION - SITE 12

| | Quantity | Unit | Unit Cost | Total Cost |
|---|---|---|---|---|
| **FIVE YEAR SITE REVIEW COSTS** | | | | |
| Five-year Site Reviews (every 5 years for 30 years) | | | | |
| Meetings (includes travel time) | | | | |
| Senior Scientist | 16 | hrs | $90.00 | $1,440 |
| Mid-level Engineer | 16 | hrs | $60.00 | $960 |
| ODCs (includes per diem and rental car) | 1 | lump sum | $110.00 | $110 |
| Five-year Report | | | | |
| Report | | | | |
| Senior Scientist | 15 | hrs | $90.00 | $1,350 |
| Mid-level Engineer | 20 | hrs | $60.00 | $1,200 |
| ODCs (includes photocopying, etc.) | 1 | lump sum | $250.00 | $250 |
| *Total 5-year costs* | | | | *$5,310* |
| *Present Worth of 5-year costs at i= 6%* | | | | *$17,352* |
| **TOTAL FIVE YEAR SITE REVIEW COSTS** | | | | **$17,352** ✓ |
| **CONTINGENCY @ 10 PERCENT** | | | | **$1,735** |
| **TOTAL COST OF ALTERNATIVE #1** | | | | **$19,087** |

## ALTERNATIVE #2: LAND USE CONTROLS - SITE 12

| | Quantity | Unit | Unit Cost | Total Cost |
|---|---|---|---|---|
| **FIVE YEAR SITE REVIEW COSTS** | | | | |
| Five-year Site Reviews (every 5 years for 30 years) | | | | |
| Meetings (includes travel time) | | | | |
| Senior Scientist | 16 | hrs | $90.00 | $1,440 |
| Mid-level Engineer | 16 | hrs | $60.00 | $960 |
| ODCs (includes per diem and rental car) | 1 | lump sum | $110.00 | $110 |
| Five-year Report | | | | |
| Report | | | | |
| Senior Scientist | 15 | hrs | $90.00 | $1,350 |
| Mid-level Engineer | 20 | hrs | $60.00 | $1,200 |
| ODCs (includes photocopying, etc.) | 1 | lump sum | $250.00 | $250 |
| *Total 5-year costs* | | | | *$5,310* |
| *Present Worth of 5-year costs at i= 6%* | | | | *$17,352* |
| **TOTAL FIVE YEAR SITE REVIEW COSTS** | | | | **$17,352** |
| Land Use Controls | | | | |
| Direct Costs | | | | |
| Survey Plat | 1 | lump sum | $2,500.00 | $2,500 |
| Land Use Restriction Fees (Filling, Legal, etc.) | 1 | lump sum | $5,000.00 | $5,000 |
| Land Use Implementation Plan | | | | |
| Senior Scientist | 20 | hrs | $90.00 | $1,800 |
| Mid-level Engineer | 40 | hrs | $60.00 | $2,400 |
| ODCs (includes photocopying, etc.) | 1 | lump sum | $250.00 | $250 |
| Total Direct Costs for Land Use Controls | | | | $11,950 |
| Annual Operation and Maintenance Costs | | | | |
| Quarterly Inspection | | | | |
| Senior Scientist | 0 | hrs | $90.00 | $0 |
| Mid-level Engineer | 32 | hrs | $60.00 | $1,920 |
| ODCs (per diem, rental vehicle, etc.) | 1 | lump sum | $320.00 | $320 |
| Quarterly Reporting | | | | |
| Senior Scientist | 8 | hrs | $90.00 | $720 |
| Mid-level Engineer | 32 | hrs | $60.00 | $1,920 |
| ODCs (per diem, rental vehicle, etc.) | 1 | lump sum | $1,000.00 | $1,000 |
| Annual Reporting | | | | |
| Senior Scientist | 2 | hrs | $90.00 | $180 |
| Mid-level Engineer | 8 | hrs | $60.00 | $480 |
| ODCs (per diem, rental vehicle, etc.) | 1 | lump sum | $250.00 | $250 |
| Total Annual Operation and Maintenance Costs | | | | $6,790 |
| *Present Worth of Land Use Control costs at i= 6%* | | | | *$93,464* ✓ |
| **TOTAL LAND USE CONTROL COSTS** | | | | **$105,414** ✓ |
| **COST OF ALTERNATIVE #2** | | | | **$122,766** ✓ |

## ALTERNATIVE #2: LAND USE CONTROLS - SITE 12

| | Quantity | Unit | Unit Cost | Total Cost |
|---|---|---|---|---|
| CONTINGENCY @10 PERCENT | | | | $12,277 |
| TOTAL COST OF ALTERNATIVE #2 | | | | $135,043 |

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | Quantity | Unit | Unit Cost | Total Cost |
|---|---|---|---|---|
| **CAPITAL COSTS** | | | | |
| **TOTAL DIRECT COSTS** | | | | |
| **Mobilization** | | | | |
| Miscellaneous | | | | |
| Storage Trailer | 3 | day | $ 150.00 | $ 450.00 |
| Trailer Delivery, Setup, Removal | 1 | each | $ 300.00 | $ 300.00 |
| Toilet/Water Cooler Service | 3 | day | $ 50.00 | $ 150.00 |
| Misc. Equipment | 1 | LS | $ 2,500.00 | $ 2,500.00 |
| Labor (Site Preparation) | | | | |
| Foreman (1 man @ 5 days @ 10hrs/day) | 30 | hrs | $ 60.00 | $ 1,800.00 |
| Equipment (Mobilization) | | | | |
| Dump Truck | 1 | each | $ 250.00 | $ 250.00 |
| Backhoe | 1 | each | $ 250.00 | $ 250.00 |
| Pressure Washer | 1 | each | $ 250.00 | $ 250.00 |
| Equipment (Mobilization) | 1 | LS | $ 1,200.00 | $ 1,200.00 |
| General Site Mobilization | 1 | LS | $ 250.00 | $ 250.00 |
| **Mobilization** | | | | **$ 7,400.00** |
| **Soil Sampling** | | | | |
| Soil Sampling and Analysis (Waste Characterization) | | | | |
| Sampling Plan | | | | |
| Mid-level Engineer/Scientist | 24 | hrs | $ 75.00 | $ 1,800.00 |
| ODCs | 1 | LS | $ 250.00 | $ 250.00 |
| Sample Collection | | | | |
| Associate Scientist | 16 | hrs | $ 60.00 | $ 960.00 |
| Technician | 16 | hrs | $ 40.00 | $ 640.00 |
| ODCs, Sample Equipment, Supplies | 1 | LS | $ 500.00 | $ 500.00 |
| Waste Characterization and Clean Fill Analysis | | | | |
| TCLP, Metals, VOCs, SVOCs, Pest/Herb, TRPH | 2 | each | $ 800.00 | $ 1,600.00 |
| **Soil Samping and Analysis** | | | | **$ 5,750.00** |
| Site Preparation | | | | |
| Labor (Site Preparation) | | | | |
| Laborers (2 men @ 1 days @ 8 hrs/day) | 16 | hrs | $ 36.00 | $ 576.00 |
| Foreman (labor included in mobilization) | | | | |
| Equipment and Disposal Costs | | | | |
| Backhoe and Operator | 3 | days | $ 1,200.00 | $ 3,600.00 |
| Miscellaneous Tools | 1 | LS | $ 300.00 | $ 300.00 |
| Transport and Disposal - Wood Debris | 3.6 | tons | $ 69.00 | $ 248.40 |
| Signs | 4 | each | $ 50.00 | $ 200.00 |

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | | | | | | |
|---|---|---|---|---|---|---|
| **Site Preparation** | | | | | **$** | **4,924.40** |
| **Clearing and Grubbing** | | | | | | |
| Foreman (1 wk @ 50 hrs/wk) | 8 | hrs | $ | 60.00 | $ | 480.00 |
| Grubbing, Removal, & Stockpile (Labor Incl) | 1 | LS | $ | 2,500.00 | $ | 2,500.00 |
| Transport and Disposal (Grub and Stumps) | 1 | LS | $ | 300.00 | $ | 300.00 |
| **Clearing and Grubbing** | | | | | **$** | **3,280.00** |
| **Loading and Off-site Landfill Disposal (70 tons)** | | | | | | |
| Backhoe and operator | 3 | days | $ | 1,200.00 | $ | 3,600.00 |
| Laborers (2 @ 3 days @ 10 hrs/day) | 60 | hrs | $ | 40.00 | $ | 2,400.00 |
| Site Superintendent | 30 | hrs | $ | 60.00 | $ | 1,800.00 |
| **RCRA Subtitle D (Solid Waste) Landfill** | | | | | | |
| Transportation and Disposal | 70 | tons | $ | 125.00 | $ | 8,750.00 |
| **Loading and Off-site Landfill Disposal (70 tons)** | | | | | **$** | **16,550.00** |
| **Vegetative Support Layer** | | | | | | |
| Topsoil - 6" layer, Purchase & Haul | 5 | $yd^3$ | $ | 8.00 | $ | 40.00 |
| Topsoil - 6" layer, Spread | 5 | $yd^3$ | $ | 2.00 | $ | 10.00 |
| Site Superintendent (1 day @ 8 hrs/day) | 8 | hrs | $ | 60.00 | $ | 480.00 |
| **Vegetative Support Layer** | | | | | **$** | **530.00** |
| **Site Restoration** | | | | | | |
| Fertlize, Seed, Mulch | 0.1 | acres | $ | 2,000.00 | $ | 200.00 |
| Demob of Equipment | 1 | LS | $ | 2,000.00 | $ | 2,000.00 |
| **Site Restoration** | | | | | **$** | **2,200.00** |
| **Land Use Controls - Direct Costs** | | | | | | |
| Total LOE for Implementation Plan | | | | | $ | 4,200.00 |
| Total ODCs for Implementation Plan | | | | | $ | 250.00 |
| Survey Plat | | | | | $ | 2,500.00 |
| Land Use Controls Fees (Filing, Legal, Etc.) | | | | | $ | 5,000.00 |
| **Land Use Controls - Direct Costs** | | | | | **$** | **11,950.00** |
| **TOTAL DIRECT COSTS** | | | | | **$** | **52,054.40** |
| **INDIRECT COSTS** | | | | | | |
| Health and Safety (@ 3% of Direct Costs) | | | | | $ | 1,561.63 |
| Administative Fees (@ 3% of Direct Costs) | | | | | $ | 1,561.63 |
| Engineering and Design (@ 10% of Direct Costs) | | | | | $ | 5,205.44 |
| Construction Support Services (@ 10% of Direct Costs) | | | | | $ | 5,205.44 |

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | | |
|---|---|---|
| **TOTAL INDIRECT COSTS** | **$** | **13,534.14** |
| ***TOAL CAPITAL COSTS - Total Direct Costs + Total Indirect Costs*** | ***$*** | ***65,588.54*** |
| **OPERATION AND MAINTENANCE COSTS (ANNUAL)** | | |
| 5-Year Site Review (see Alternative #1) | | |
| Total LOE | $ | 4,950.00 |
| Total ODCs | $ | 360.00 |
| Subtotal Cost | $ | 5,310.00 |
| **Present Worth (capitallized @ 6%, 30 years)** | **$** | **17,352.00** |
| Land Use Controls - Quarterly and Annual Inspection and Reporting (See Alt #2) | | |
| Total Direct Costs | $ | 11,950.00 |
| O&M Present Worth (capitalized @ 6%, 30 years) | $ | 93,464.00 |
| **Total Costs for Land Use Controls** | **$** | **105,414.00** |
| ***TOTAL O&M COSTS (Annual Monitoring, 5-Year Review, LUCs)*** | ***$*** | ***122,766.00*** |
| ***TOTAL CAPITAL COSTS & O&M COSTS*** | ***$*** | ***188,354.54*** |
| **Contingency (@ 10%)** | **$** | **18,835.45** |
| ***TOTAL COST OF ALTERNATIVE #3*** | ***$*** | ***207,190.00*** |

# APPENDIX D

# RESPONSE TO REGULATORY COMMENTS

**Response to Review Comments**
**For Draft Feasibility Study**
**Site 12, Tetraethyl Lead Disposal Area**
**NAS Whiting Field, Milton, Florida**

## Florida Department of Environmental Protection

1. Alternative 3 includes soil excavation and removal. Land use controls are also included in this alternative, however, implying that risks will remain at the site regardless of soil removal. Land use controls in Alternative 3 also contribute $113,992 to the total cost of this alternative. (Cost for identical land use controls specified in Alternative 2 is $105,414, $8,578 less than Alternative 3). An explanation of the marginal benefits of soil removal should be described in Alternative 3 to justify its specification, along with the rationales for cost differences due to land use controls.

   **Response:** The rationale and benefits for including soil removal in Alternative 3 was presented on page 3-5 (*Although soil mounds at Site 12 are not considered hot spots [or areas with elevated contaminant concentrations], and no RAO was established for treatment or disposal of the soil mounds, the mounds are a potential physical hazard. When coupled with LUCs, disposal of the soil mounds was considered to be a possible alternative for Site 12*).

   Costs for Land Use Controls in Alternative 3 have been revised to be consistent with costs presented for Alternative 2. A revised cost estimate for Alternative 3 is attached to this Response to Comments.

**Response to Review Comments**
**For Draft Feasibility Study**
**Site 12, Tetraethyl Lead Disposal Area**
**NAS Whiting Field, Milton, Florida**

## U.S. Environmental Protection Agency

### General Comment

1. Based on the information presented in the FS Report and the agreement between NAS Whiting Field and Florida Department of Environmental Protection, the proposed selection of Remedial Alternative 2, land use controls, is supported.

   **Response:** Agree.

### Specific Comments

1. **Page 1-2, Second Paragraph, First Bullet**. The text states, " . . . a site description and a summary of previous investigations for Site 1; . . .". The site reference should be corrected to Site 12 instead of Site 1.

   **Response**: Agree. The site reference on Page 1-2 will be revised to read "Site 12".

2. **Page 1-5, First Paragraph**. Delete the words "**FS and** " in the fourth sentence of the paragraph. Community acceptance is evaluated based on comments received, primarily, on the Proposed Plan; however, the public is encouraged to review any other documents that make up the administrative record for the site including the FS.

   **Response:** Agree. The words "FS and" will be deleted.

3. **Page 1-6, First Paragraph**. In the first sentence at the top of the page, it is more appropriate to use the word **options** rather than **opportunities** to describe a range of alternatives for meeting the RAOs.

   **Response:** Agree. The word "*opportunities*" will be replaced by "*options*".

4. **Page 3-1, Third Paragraph**. It should be noted that based on the type of waste as well as the disposal methods employed at this site, in that the tank bottom sludge was deposited on the ground surface and later covered with soil, the site does not meet the definition of a municipal landfill.

   **Response:** The second sentence of the third paragraph *(Because municipal landfill sites typically have similar ..... .....required for remediation.)* will be deleted.

5. **Appendix C, Cost and Volume Calculations for Remedial Alternatives 3**. The method used to calculate the volume of estimated soil and sludge is inaccurate.

   To provide an accurate cost estimate for evaluating Alternative 3, the calculated soil and sludge volume to be excavated should include an allowance for "fluff". Since the sludge and soil have been in place for approximately 30 years, compaction has occurred. A "fluff factor" of approximately 20% to 30% should be used to account for soil and sludge expansion after excavation. This expansion due to fluff will result in a larger volume of soil being excavated than what was indicated in the original calculations. The original estimate should be recalculated.

**Response to Review Comments**
**For Draft Feasibility Study**
**Site 12, Tetraethyl Lead Disposal Area**
**NAS Whiting Field, Milton, Florida**

The FS Report calculates the cost of transportation and disposal of the excavated soil and sludge per truck load on a volume basis. Calculations on a volume basis do not consider increased weight of the material based on soil moisture content. Since weight restrictions apply to material transported over roadways and disposal costs at approved landfills is based on weight, it is possible that doing calculations on a volume basis would result in an underestimation of both the weight of material to be disposed of and the number of trucks which will be needed to transport all of the material to the approved landfill. The cost estimate should be recalculated taking these factors into consideration.

The cost estimate in Appendix C for Alternative 3 did not include the cost for the laboratory analyses of the "clean" fill. Page 4-10 of the FS Report states, "The soil will be analyzed for target compound list volatile organic compounds, semi-volatile organic compounds, pesticides, and polychlorinated biphenyls, target analyte list inorganic analytes and total recoverable petroleum hydrocarbons and checked for pH to verify that it is "clean" fill and exhibits a pH between 6 and 7.5." The cost estimate in Appendix C for Alternative 3 did not include costs for these laboratory analyses. Analytical costs for the clean fill should be included in the overall cost estimates.

Since soil and sludge volumes were not calculated correctly, costs could possibly increase for Alternative 3 for excavation and disposal when the calculations are performed correctly. The transportation and disposal costs should be recalculated using all of the factors mentioned in this comment to ensure that the overall costs of Alternative 3 are as correct as possible.

**Response:** The costs for Alternative #3 have been recalculated. The following revisions have been included in the calculations.

- A 20% safety factor has been incorporated into the calculations to account for compaction.
- Calculations have also been converted into weight basis.
- Costs for analysis of clean fill have been included.

The revised estimate is attached to this Response to Comments.

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | Quantity | Unit | | Unit Cost | | Total Cost |
|---|---|---|---|---|---|---|
| CAPITAL COSTS | | | | | | |
| TOTAL DIRECT COSTS | | | | | | |
| Mobilization | | | | | | |
| Miscellaneous | | | | | | |
| Storage Trailer | 3 | day | $ | 150.00 | $ | 450.00 |
| Trailer Delivery, Setup, Removal | 1 | each | $ | 300.00 | $ | 300.00 |
| Toilet/Water Cooler Service | 3 | day | $ | 50.00 | $ | 150.00 |
| Misc. Equipment | 1 | LS | $ | 2,500.00 | $ | 2,500.00 |
| Labor (Site Preparation) | | | | | | |
| Foreman (1 man @ 5 days @ 10hrs/day) | 30 | hrs | $ | 60.00 | $ | 1,800.00 |
| Equipment (Mobilization) | | | | | | |
| Dump Truck | 1 | each | $ | 250.00 | $ | 250.00 |
| Backhoe | 1 | each | $ | 250.00 | $ | 250.00 |
| Pressure Washer | 1 | each | $ | 250.00 | $ | 250.00 |
| Equipment (Mobilization) | 1 | LS | $ | 1,200.00 | $ | 1,200.00 |
| General Site Mobilization | 1 | LS | $ | 250.00 | $ | 250.00 |
| **Mobilization** | | | | | **$** | **7,400.00** |
| Soil Sampling | | | | | | |
| Soil Sampling and Analysis (Waste Characterization) | | | | | | |
| Sampling Plan | | | | | | |
| Mid-level Engineer/Scientist | 24 | hrs | $ | 75.00 | $ | 1,800.00 |
| ODCs | 1 | LS | $ | 250.00 | $ | 250.00 |
| Sample Collection | | | | | | |
| Associate Scientist | 16 | hrs | $ | 60.00 | $ | 960.00 |
| Technician | 16 | hrs | $ | 40.00 | $ | 640.00 |
| ODCs, Sample Equipment, Supplies | 1 | LS | $ | 500.00 | $ | 500.00 |
| Waste Characterization and Clean Fill Analysis | | | | | | |
| TCLP, Metals, VOCs, SVOCs, Pest/Herb, TRPH | 2 | each | $ | 800.00 | $ | 1,600.00 |
| **Soil Samping and Analysis** | | | | | **$** | **5,750.00** |
| Site Preparation | | | | | | |
| Labor (Site Preparation) | | | | | | |
| Laborers (2 men @ 1 days @ 8 hrs/day) | 16 | hrs | $ | 36.00 | $ | 576.00 |
| Foreman (labor included in mobilization) | | | | | | |
| Equipment and Disposal Costs | | | | | | |
| Backhoe and Operator | 3 | days | $ | 1,200.00 | $ | 3,600.00 |
| Miscellaneous Tools | 1 | LS | $ | 300.00 | $ | 300.00 |
| Transport and Disposal - Wood Debris | 3.6 | tons | $ | 69.00 | $ | 248.40 |
| Signs | 4 | each | $ | 50.00 | $ | 200.00 |

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | | | | | | |
|---|---|---|---|---|---|---|
| **Site Preparation** | | | | | **$** | **4,924.40** |
| **Clearing and Grubbing** | | | | | | |
| Foreman (1 wk @ 50 hrs/wk) | 8 | hrs | $ | 60.00 | $ | 480.00 |
| Grubbing, Removal, & Stockpile (Labor Incl) | 1 | LS | $ | 2,500.00 | $ | 2,500.00 |
| Transport and Disposal (Grub and Stumps) | 1 | LS | $ | 300.00 | $ | 300.00 |
| **Clearing and Grubbing** | | | | | **$** | **3,280.00** |
| **Loading and Off-site Landfill Disposal (70 tons)** | | | | | | |
| Backhoe and operator | 3 | days | $ | 1,200.00 | $ | 3,600.00 |
| Laborers (2 @ 3 days @ 10 hrs/day) | 60 | hrs | $ | 40.00 | $ | 2,400.00 |
| Site Superintendent | 30 | hrs | $ | 60.00 | $ | 1,800.00 |
| **RCRA Subtitle D (Solid Waste) Landfill** | | | | | | |
| *Transportation and Disposal* | 70 | tons | $ | 125.00 | $ | 8,750.00 |
| **Loading and Off-site Landfill Disposal (70 tons)** | | | | | **$** | **16,550.00** |
| **Vegetative Support Layer** | | | | | | |
| Topsoil - 6" layer, Purchase & Haul | 5 | $yd^3$ | $ | 8.00 | $ | 40.00 |
| Topsoil - 6" layer, Spread | 5 | $yd^3$ | $ | 2.00 | $ | 10.00 |
| *Site Superintendent* (1 day @ 8 hrs/day) | 8 | hrs | $ | 60.00 | $ | 480.00 |
| **Vegetative Support Layer** | | | | | **$** | **530.00** |
| **Site Restoration** | | | | | | |
| Fertlize, Seed, Mulch | 0.1 | acres | $ | 2,000.00 | $ | 200.00 |
| Demob of Equipment | 1 | LS | $ | 2,000.00 | $ | 2,000.00 |
| **Site Restoration** | | | | | **$** | **2,200.00** |
| **Land Use Controls - Direct Costs** | | | | | | |
| Total LOE for Implementation Plan | | | | | $ | 4,200.00 |
| Total ODCs for Implementation Plan | | | | | $ | 250.00 |
| Survey Plat | | | | | $ | 2,500.00 |
| Land Use Controls Fees (Filing, Legal, Etc.) | | | | | $ | 5,000.00 |
| **Land Use Controls - Direct Costs** | | | | | **$** | **11,950.00** |
| **TOTAL DIRECT COSTS** | | | | | **$** | **52,054.40** |
| **INDIRECT COSTS** | | | | | | |
| Health and Safety (@ 3% of Direct Costs) | | | | | $ | 1,561.63 |
| Administative Fees (@ 3% of Direct Costs) | | | | | $ | 1,561.63 |
| Engineering and Design (@ 10% of Direct Costs) | | | | | $ | 5,205.44 |
| Construction Support Services (@ 10% of Direct Costs) | | | | | $ | 5,205.44 |

# ALTERNATIVE #3: SOIL DISPOSAL AND LAND USE CONTROLS, SITE 12

| | | |
|---|---|---|
| **TOTAL INDIRECT COSTS** | **$** | **13,534.14** |
| ***TOAL CAPITAL COSTS - Total Direct Costs + Total Indirect Costs*** | ***$*** | ***65,588.54*** |
| **OPERATION AND MAINTENANCE COSTS (ANNUAL)** | | |
| 5-Year Site Review (see Alternative #1) | | |
| Total LOE | $ | 4,950.00 |
| Total ODCs | $ | 360.00 |
| Subtotal Cost | $ | 5,310.00 |
| **Present Worth (capitallized @ 6%, 30 years)** | **$** | **17,352.00** |
| Land Use Controls - Quarterly and Annual Inspection and Reporting (See Alt #2) | | |
| Total Direct Costs | $ | 11,950.00 |
| O&M Present Worth (capitalized @ 6%, 30 years) | $ | 93,464.00 |
| **Total Costs for Land Use Controls** | **$** | **105,414.00** |
| ***TOTAL O&M COSTS (Annual Monitoring, 5-Year Review, LUCs)*** | ***$*** | ***122,766.00*** |
| ***TOTAL CAPITAL COSTS & O&M COSTS*** | ***$*** | ***188,354.54*** |
| **Contingency (@ 10%)** | **$** | **18,835.45** |
| ***TOTAL COST OF ALTERNATIVE #3*** | ***$*** | ***207,190.00*** |